REZNOR®

MAPS®

MAPS® dH™

Form O-MAPSIII Cabinet D (Version D)

Obsoletes Form O-MAPSIII Cabinet D (Version C)

Operation / Maintenance / Service

Applies to: **Models RCB, RDB, RDCB, RDDB, RECB, and REDB Cabinet "D" Sizes**

C ETL CM LISTED US Intertek

R-410A Refrigerant

AGENCY PROCESS CONVERGENT CQS CUSTOMER QUALITY SYSTEM START-UP PRODUCT WARRANTY

DANGER

This unit contains R-410A high pressure refrigerant. Hazards exist that could result in personal injury or death. Installation, maintenance, and service should only be performed by an HVAC technician qualified in R-410A refrigerant and using proper tools and equipment. Due to much higher pressure of R-410A refrigerant, DO NOT USE service equipment or tools designed for R22 refrigerant.

IMPORTANT: Do not release refrigerant to the atmosphere! If required service procedures include the adding or removing of refrigerant, the service technician must comply with all federal, state and local laws. The procedures discussed in this manual should only be performed by a qualified HVAC technician.

Table of Contents

1.0 General

This booklet includes operation, maintenance, and service information on the MAPS®III Cabinet D Size systems. Before beginning any procedure, carefully review the information, paying particular attention to the warnings. Handling of refrigerant should only be performed by a certified HVAC technician with knowledge of the requirements of R-410A refrigerant and in compliance with all codes and requirements of authorities having jurisdiction.

The instructions in this manual apply to the following MAPS®III models.

NOTE: To confirm that this booklet is applicable, see list of D Cabinet Sizes in Paragraph 2.3, page 5.

Model	Description
RCB	**Makeup Air Cooling Packaged System, 5200-13000 CFM**
RDCB	**Makeup Air Cooling Packaged System, 5200-13000 CFM, with Gas Heat Section (500-1600 MBH)**
RECB	**Makeup Air Cooling Packaged System, 5200-13000 CFM, with Electric Heat Section (120 & 180 kw)**
RDB	**Makeup Air Cooling and Re-heat Pump Reheat Cycle Packaged System, 5200-13000 CFM**
RDDB	**Makeup Air Cooling and Re-heat Pump Reheat Cycle Packaged System, 5200-13000 CFM, with a Gas Heat Section (500-1600 MBH)**
REDB	**Makeup Air Cooling and Re-heat Pump Reheat Cycle Packaged System, 5200-13000 CFM, with Electric Heat Section (120 & 180 kw)**

Definitions of Hazard Intensity Levels used in this Manual

There are warning labels on the unit and throughout this manual. For your safety, comply with all warnings during installation, operation, and service of this system. See definitions of Hazard Intensity Levels of warnings below.

HAZARD INTENSITY LEVELS

1. **DANGER: Failure to comply will result in severe personal injury or death and/or property damage.**
2. **WARNING: Failure to comply could result in severe personal injury or death and/or property damage.**
3. **CAUTION: Failure to comply could result in minor personal injury and/or property damage.**

2.0 Maintenance Requirements

This unit will operate with a minimum of maintenance. To ensure long life and satisfactory performance, a system that is operating under normal conditions should be inspected according to the Maintenance Schedule. If in an area where an unusual amount of dust or soot or other impurities are present in the air, more frequent inspection is recommended.

Refer to the illustration in **FIGURE 1**, page 4, and follow the instructions in the referenced paragraphs to maintain this equipment. Maintenance requirements and procedures apply to all Models unless noted.

NOTE: If replacement parts are required, use only factory-authorized parts. For information, go to www.ReznorHVAC.com or call 800-695-1901

WARNING

Lock power OFF before performing all maintenance procedures (except where power is required such as checking refrigerant pressure and temperature). Lock disconnect switch in OFF position. If the system has a heat section, when you turn off the power supply, turn off the gas. See Hazard Levels, page 2.

2.1 Maintenance Schedule

Monthly

- □ Inspect filters; clean or replace as needed. See Paragraph 3.1.
- □ Inspect the condensate drain; clean as needed. For information, see Form I-MAPSIII&IV, Paragraph 6.2.

Semi-Annually

- □ Inspect the unit blower plenum fan and belt. Check belt for tension, wear, and alignment. Adjust or replace as needed. Clean dirt from blower and motor. See Paragraph 3.2.

Annually

NOTE: Redo the cooling startup procedures when the cooling season begins. Refer to Startup instructions in the installation manual, Form I-MAPSIII&IV, Paragraph 10.0.

Beginning of the cooling season or more frequently in year-round cooling climate (applies to all Models):

- □ Inspect the wiring for any damaged wire. Replace damaged wiring.
- □ Inspect the condensate drain pan. Clean the coil cabinet, the drain pan, and fill the trap.
- □ Inspect/clean condenser fans. See Paragraph 3.3.
- □ Inspect/clean all coils. See Paragraph 3.4.
- □ Check compressor operation. See Paragraph 3.6.
- □ Check refrigerant pressure and temperatures (superheat and subcool). These checks are done when the system is operating. See Paragraph 3.5.

Models RDCB & RDDB with a gas heat section (beginning of the heating season) - See Section 4.0.

- □ Clean all dirt and grease from the combustion air openings and the venter assembly.
- □ Check the heat exchanger, burner, and venter for scale, dust, or lint accumulation. Clean as needed.
- □ Check the gas valves to ensure that gas flow is being shutoff completely.

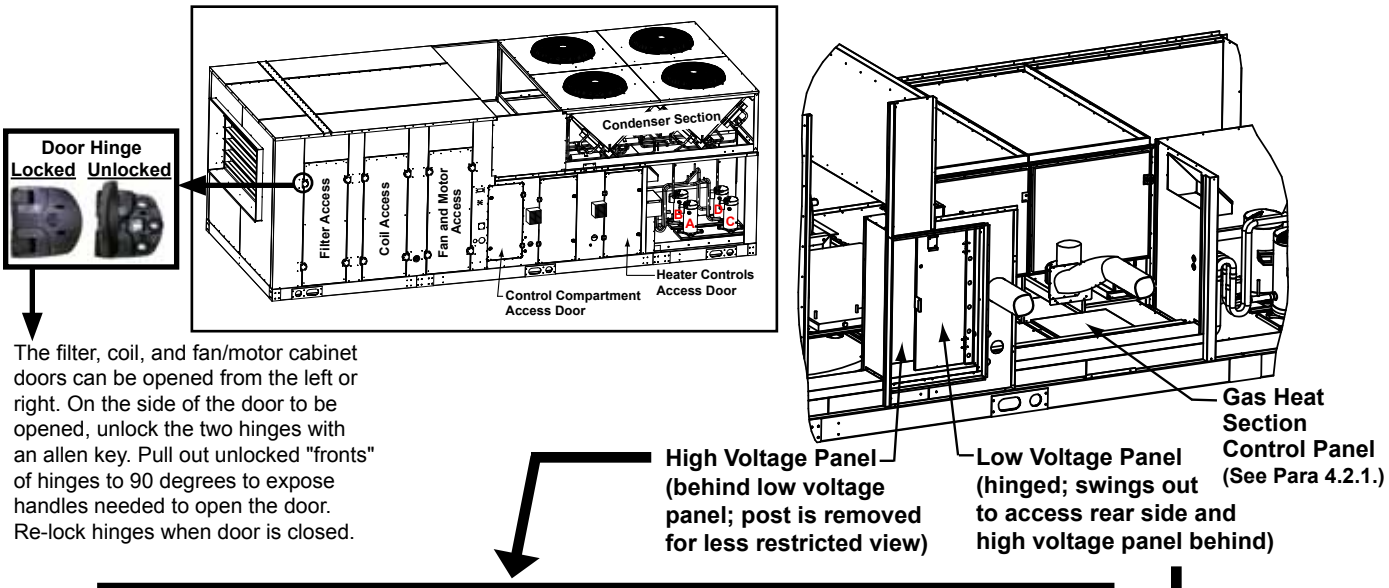
Models RECB & REDB with an electric heat section (beginning of the heating season) - See Section 5.0.

- □ Check the wiring connections.
- □ Check the heat section and electric elements for dust or lint accumulation. Carefully clean as needed.

2.0 Maintenance Requirements (cont'd)

2.2 Control Locations

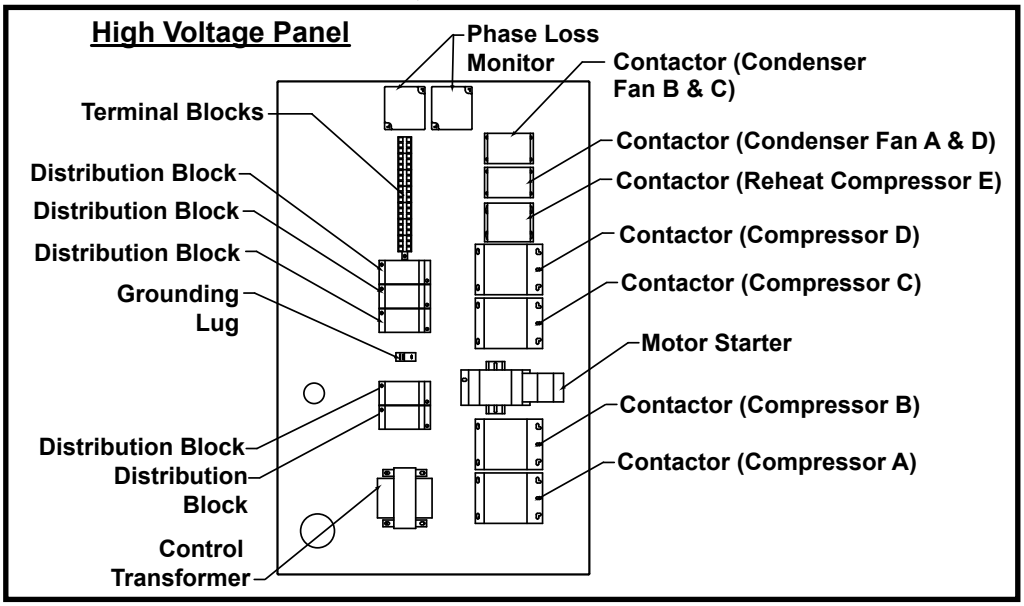
FIGURE 1 - Access Panels and High and Low Voltage Control Locations

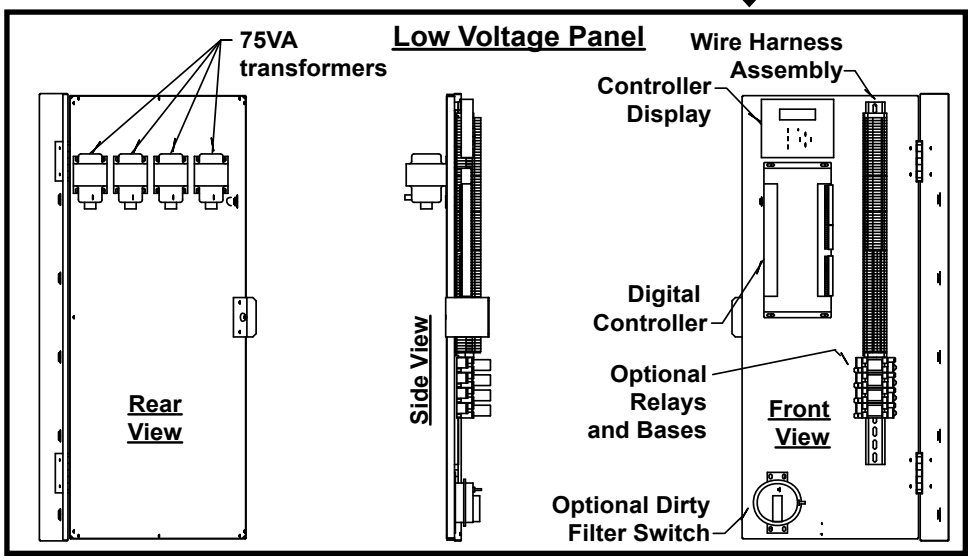


The filter, coil, and fan/motor cabinet doors can be opened from the left or right. On the side of the door to be opened, unlock the two hinges with an allen key. Pull out unlocked "fronts" of hinges to 90 degrees to expose handles needed to open the door. Re-lock hinges when door is closed.

High Voltage Panel (behind low voltage panel; post is removed for less restricted view)

Low Voltage Panel (hinged; swings out to access rear side and high voltage panel behind)





NOTE: Electric heat Models RECB and REDB have additional electrical panels in the heat section; see Paragraph 5.0, page 33.

2.3 MAPSIII D Cabinet Sizes

Model RCB	Cabinet Size
360	D
480	
600	
720	

Model RDCB	Gas Heat Section Size								Electric Heat Section	
	-500	-600	-700	-800	-1000	-1200	-1400	-1600	RECB120	RECB180
360	D	D	D	D	D	D	D	D	D	D
480	D	D	D	D	D	D	D	D	D	D
600	D	D	D	D	D	D	D	D	D	D
720	D	D	D	D	D	D	D	D	D	D

Model RDB	Cabinet Size
418	D
444	
484	
538	
564	
602	
658	
684	
722	
804	
842	

Model RDDB	Gas Heat Section Size								Electric Heat Section	
	-500	-600	-700	-800	-1000	-1200	-1400	-1600	REDB120	REDB180
418	D	D	D	D	D	D	D	D	D	D
444	D	D	D	D	D	D	D	D	D	D
484	D	D	D	D	D	D	D	D	D	D
538	D	D	D	D	D	D	D	D	D	D
564	D	D	D	D	D	D	D	D	D	D
602	D	D	D	D	D	D	D	D	D	D
658	D	D	D	D	D	D	D	D	D	D
684	D	D	D	D	D	D	D	D	D	D
722	D	D	D	D	D	D	D	D	D	D
804	D	D	D	D	D	D	D	D	D	D
842	D	D	D	D	D	D	D	D	D	D

3.0 Maintenance/ Service Procedures

3.1 Filters

The filter section is equipped with 4 inches of pleated disposable or permanent aluminum filters. To remove filters, open the door and slide filters out.

If equipped with permanent aluminum filters, there are sixteen 2"x20"x24" filters. Remove the filters, wash, rinse, allow to dry, and slide them back in the cabinet. The P/N for replacement or extra filter is **223065**; quantity is 16.

If equipped with pleated disposable filters, there are eight 4"x20"x24" filters, either MERV8 or MERV13.. Replace dirty filters. Exposure to humid makeup air can accelerate filter degradation. Systems with disposable filters require more frequent filter inspection. The P/N for one replacement or extra MERV8 filter is **222480**; quantity required is 8. The P/N for one replacement or extra MERV13 filter is **260828**; quantity required is 8.

Dirty Filter Switch - If equipped with a dirty filter switch, check the condition of the sensing tubes to be sure that they are not blocked. Check the wiring connections. To set a new switch, see Installation Form I-MAPSIII&IV, Paragraph 8.1, Replacement switch is **P/N 105507**.

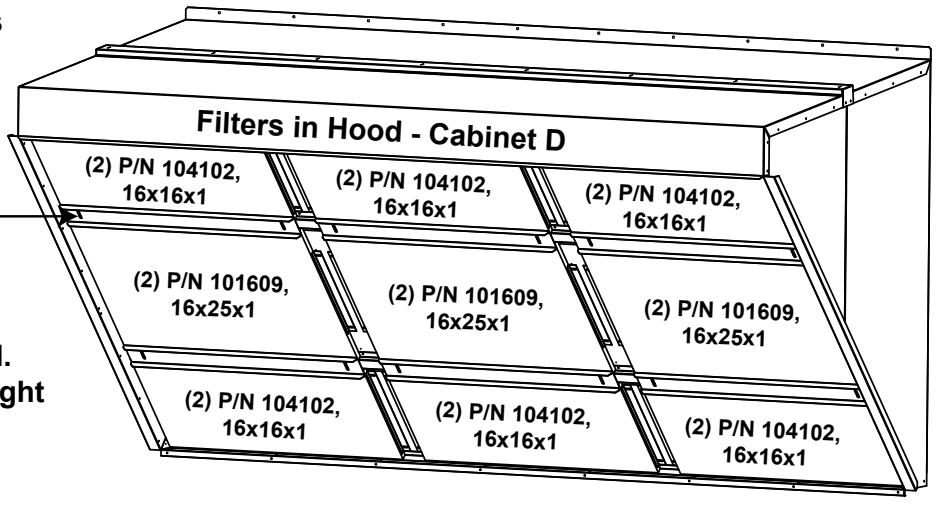
Permanent Filters in the Outside Air Hood

If equipped with an outside air hood, there are 1" permanent, aluminum filters at the entrance of the hood. The filters act as a moisture eliminator and bird screen.

When inspecting the inlet air filters, inspect the outside air hood filters. If cleaning is needed, remove the filters, clean, rinse, dry and re-install. **NOTE:** If it is more convenient to keep an extra clean set of filters, filter sizes and part numbers are shown in the illustration.

FIGURE 2 - Removing Filters from Outside Air Hood

1) Loosen wing nuts and slide clamp.
2) Remove filters.
3) Repeat for all filters.
4) Wash and dry filters.
5) Re-install filters in hood. Be sure wing nuts are tight and filters secure.



3.0 Maintenance/ Service Procedures (cont'd)

3.2 Drive Components

Bearings - Bearings with a grease fitting should be lubricated twice a year with a high temperature, moisture-resistant grease. (Type NLGI-1 or -2 standard grease is recommended.) Be sure to clean the grease fitting before adding grease. Add grease with a handgun until a slight bead of grease forms at the seal. Be careful not to unseat the seal by over lubricating. NOTE: If unusual environmental conditions exist (temperatures below 32°F or above 200°F; moisture; or contaminants), more frequent lubrication is required.

CAUTION: If the blower is unused for more than three months, bearings with a grease fitting should be purged with new grease prior to start-up.

Setscrews - Check all of the setscrews (bearing/blower hubs and pulleys). Torque pulley setscrews a minimum of 110 in-lb to 130 in-lb maximum.

A bearing hub setscrew for a 1-3/8" to 1-3/4" shaft requires a 5/16" socket and a tightening torque of 165 in-lbs.

Belts - Check belt for proper tension and wear. Adjust belt tension as needed. Replace worn belts.

Blower systems are equipped with either Power Twist Plus® linked blower belt or a solid belt. The linked belts are designed in sections allowing for easy sizing and adjustment. The belt is sized at the factory for the proper tension. If the belt needs adjustment, the recommended method of shortening the belt length is to count the number of links and remove one link for every 24. (A link is made up of two joining sections of belt. For easier removal of links, turn the belt inside out. But be sure to turn it back before installing.)

If equipped with a solid belt, adjust the belt tension by turning the adjusting screw on the motor base until the belt can be depressed 1/2" (13mm) on each side. After correct tension is achieved, re-tighten the locknut on the adjustment screw.

Proper belt tension is important to the long life of the belt and motor.

Be sure belts are aligned in the pulleys. If a belt is removed or replaced, be sure to align directional arrows on the belt to the proper drive rotation.

Motor and Blower - Inspect the motor mounts periodically. Remove dust and dirt accumulation from the motor and wheel.

The blower has cast iron, pillowblock, sealed bearings. Under most operating conditions, re-lubrication is unnecessary. If lubrication is required, use a lubricant compatible to Shell Alvania #2 (lithium base - Grade 2). Operating temperature range is -30 to 230°F.

"D" size cabinets have plenum fan blowers which have an extension to the grease fitting on the side of the fan assembly.

If any drive parts need to be replaced, use only factory-authorized replacements designed for the application.

3.3 Condenser Fans

Depending on the size, there are two, three, or four fans in the condenser section. If parts need to be replaced, use only factory authorized replacement parts.

See **FIGURE 3** for assembled dimensions and proper fan rotation direction.

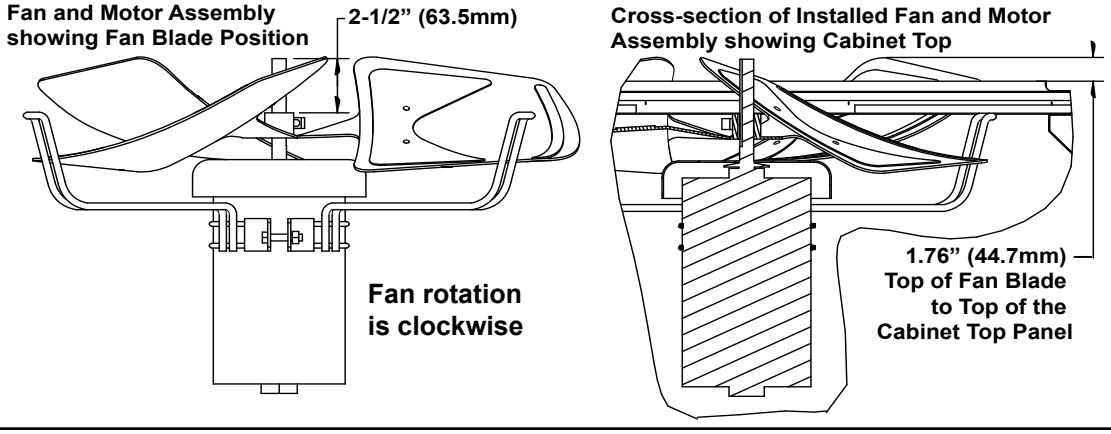


FIGURE 3 - Condenser Fan Assembly Dimensions and Rotation

3.4 Coil Maintenance

Inspect all cooling system coils at the beginning of the cooling season or more often if needed. Follow the cleaning instructions below. If additional cleaning is required or if a coil must be removed for any reason, consult the factory. Be prepared to provide rating plate and installation information.

Condenser Coil Access - The bank of condensing coils is located on top of the unit.

Condenser Coil Cleaning Instructions:

1) Verify that the electrical power has been turned off and the disconnect switch locked.
2) Use a soft brush to remove any dirt and debris from the coils.
3) Spray with cold or warm (not hot) water and a cleaning solution (non-acid based coil cleaner is recommended). Due to possible damage to the coil, **do not use high pressure spray**.
4) When clean, rinse with cool, clean water.

Evaporator Coil Access - The evaporative coils can be accessed by opening the coil cabinet door.

Inspect coils for debris, dirt, grease, lint, pollen, mold, or any element which would obstruct heat transfer or airflow. Inspect coils and tubing for physical damage. Inspect feeders, piping connections, coil headers, and return bends for signs of fatigue, rubbing, and physical damage.

Clean the coils annually, or more often if needed. Use the proper tools and follow the instructions carefully to avoid damaging the coil. Use of a non-acid based coil cleaner is recommended. Due to possible damage to the coil, high pressure spray is not recommended.

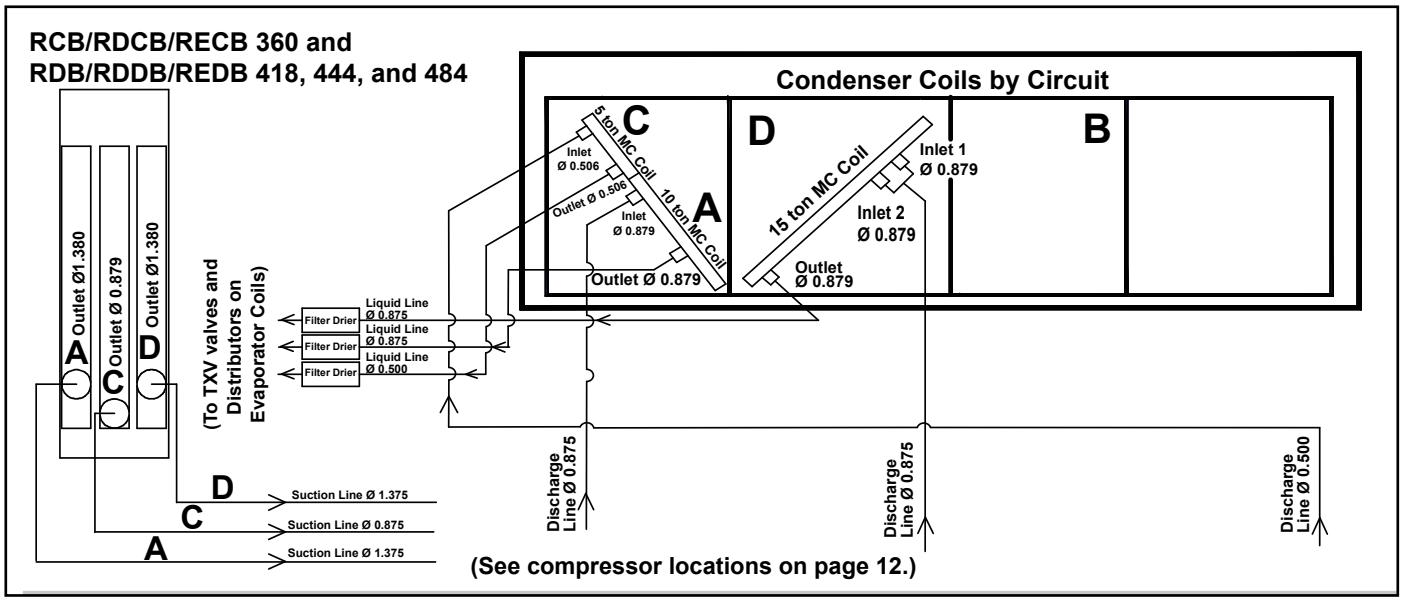
Evaporator Coil Cleaning Instructions:

1) Verify that the electrical power has been turned off and the disconnect switch locked.
2) Open the access panels.
3) Use a soft brush to remove any dirt and debris from both sides of a coil.
4) Spray with cold or warm (not hot) water and a cleaning solution (non-acid based coil cleaner is recommended). Due to possible damage to the coil, high pressure spray is **not** recommended. First spray the leaving airflow side, then the inlet airflow side.

   As much as possible, spray the solution perpendicular to the face of the coil.

   Follow the instructions on the cleaning solution. When cleaning process is complete, rinse both sides with cool, clean water.

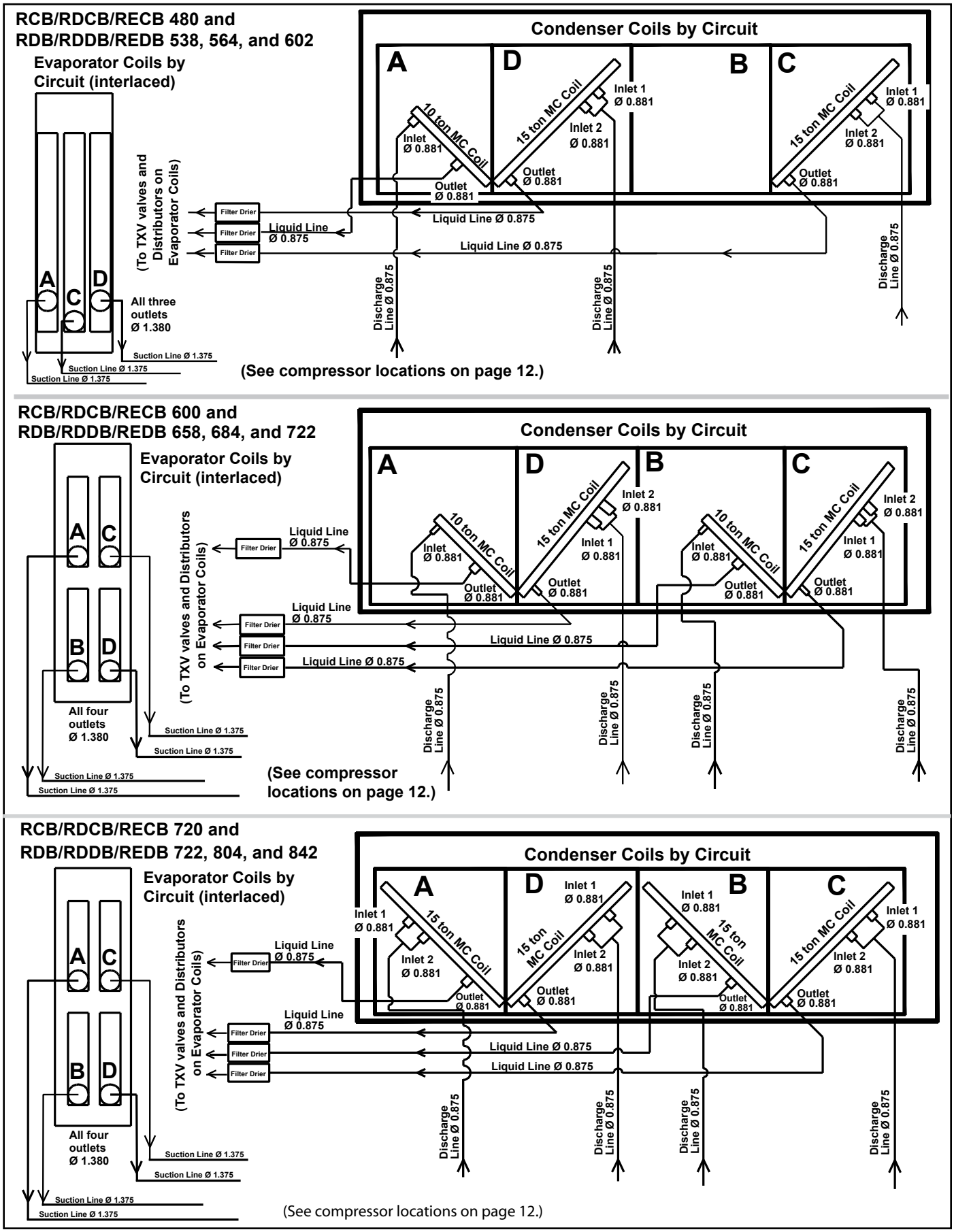
FIGURE 4 - Coil Circuits (Views are from the control side of the system.)



3.0 Maintenance/Service Procedures (cont'd)

3.4 Coil Maintenance (cont'd)

FIGURE 4 (cont'd) - Coil Circuits (Views are from the control side of the system.)



3.5 Check Refrigerant Pressure and Temperatures (subcooling and superheat)

DANGER

The refrigeration circuits are high pressure systems. Hazards exist that could result in personal injury or death. Removal, installation, and service of this scroll compressor must be performed by a technician qualified in R-410A refrigerant. DO NOT USE tools or service equipment designed for R22 refrigerant. See Hazard Levels, page 2.

Check SUBCOOLING

Measure and record temperature and pressure of the liquid line at the condenser coil outlet.

STEP 1) Record Measurements: Temperature = _____°F (°C) and Pressure = _____ psig

STEP 2) From **Temperature/Pressure Conversion Chart** (page 10), convert Measured Pressure (STEP 1) to _____°F (°C)

STEP 3) Subtract Measured Temperature (STEP 1) from Temperature from Conversion Chart (STEP 2): _____°F (°C) - _____°F (°C) = _____°F (°C) degrees of Subcooling

Recommended subcooling with outdoor temperature range of 70 to 95°F (21 to 35°C) is 10 to 12 degrees F (5.6 to 6.7 degrees C).

Too much subcooling indicates a refrigerant overcharge. To reduce the subcooling, remove excess refrigerant. Too little subcooling indicates a refrigerant undercharge. To increase subcooling, slowly add R-410A refrigerant.

WARNING

Do not release refrigerant to the atmosphere. When adding or removing refrigerant, the qualified technician must comply with all national, state/province, and local laws.

Determine SUPERHEAT

Measure and record temperature (insulate probe from surrounding air temperature) and pressure in the suction line at the compressor inlet.

STEP 1) Record Measurements: Temperature = _____°F (°C) and Pressure = _____ psig

STEP 2) From **Temperature/Pressure Conversion Chart** (below), convert Measured Pressure (STEP 1) to _____°F (°C)

STEP 3) Subtract Measured Temperature (STEP 1) from Temperature from Conversion Table (STEP 2): _____°F (°C) - _____°F (°C) = _____°F (°C) degrees of Superheat

Recommended superheat at is 8 to 12 degrees F (4.5 to 6.7 degrees C).

Typically, too much superheat indicates that the evaporator coil is undercharged. Too little superheat typically indicates that the evaporator coil is overcharged and may potentially flood liquid refrigerant to the compressor. To reduce the superheat, adjust the thermal expansion valve by turning the adjusting stem counterclockwise. To increase the superheat, adjust the thermal expansion valve by turning the adjusting stem clockwise.

3.0 Maintenance/Service Procedures (cont'd)

3.5 Check Refrigerant Pressure and Temperatures (subcooling and superheat) (cont'd)

Temperature/Pressure Conversion Chart

R-410A Refrigerant			R-410A Refrigerant			R-410A Refrigerant			R-410A Refrigerant		
Pressure	Temperature		Pressure	Temperature		Pressure	Temperature		Pressure	Temperature	
PSI	°F	°C	PSI	°F	°C	PSI	°F	°C	PSI	°F	°C
1.8	-55	-48.3	56.4	6	-14.4	93.5	28	-2.2	143.3	50	10.0
4.3	-50	-45.6	57.9	7	-13.9	95.5	29	-1.7	156.6	55	12.8
7.0	-45	-42.8	59.3	8	-13.3	97.5	30	-1.1	170.7	60	15.6
10.1	-40	-40.0	60.8	9	-12.8	99.5	31	-0.6	185.7	65	18.3
13.5	-35	-37.2	62.3	10	-12.2	101.6	32	0.0	201.5	70	21.1
17.2	-30	-34.4	63.9	11	-11.7	103.6	33	0.6	218.2	75	23.9
21.4	-25	-31.7	65.4	12	-11.1	105.7	34	1.1	235.9	80	26.7
25.9	-20	-28.9	67.0	13	-10.6	107.9	35	1.7	254.6	85	29.4
27.8	-18	-27.8	68.6	14	-10.0	110.0	36	2.2	274.3	90	32.2
29.7	-16	-26.7	70.2	15	-9.4	112.2	37	2.8	295.0	95	35.0
31.8	-14	-25.6	71.9	16	-8.9	114.4	38	3.3	316.9	100	37.8
33.9	-12	-24.4	73.5	17	-8.3	116.7	39	3.9	339.9	105	40.6
36.1	-10	-23.3	75.2	18	-7.8	118.9	40	4.4	364.1	110	43.3
38.4	-8	-22.2	77.0	19	-7.2	121.2	41	5.0	389.6	115	46.1
40.7	-6	-21.1	78.7	20	-6.7	123.6	42	5.6	416.4	120	48.9
43.1	-4	-20.0	80.5	21	-6.1	125.9	43	6.1	444.5	125	51.7
45.6	-2	-18.9	82.3	22	-5.6	128.3	44	6.7	474.0	130	54.4
48.2	0	-17.8	84.1	23	-5.0	130.7	45	7.2	505.0	135	57.2
49.5	1	-17.2	85.9	24	-4.4	133.2	46	7.8	537.6	140	60.0
50.9	2	-16.7	87.8	25	-3.9	135.6	47	8.3	571.7	145	62.8
52.2	3	-16.1	89.7	26	-3.3	138.2	48	8.9	607.6	150	65.6
53.6	4	-15.6	91.6	27	-2.8	140.7	49	9.4	645.2	155	68.3
55.0	5	-15.0									

3.6 Compressor Maintenance and Replacement

DANGER

The refrigeration circuits are high pressure systems. Hazards exist that could result in personal injury or death. It is therefore required that the removal and installation of this scroll compressor be performed by a technician qualified in R-410A refrigerant. See Hazard Levels, page 2.

DANGER

Never use oxygen to pressurize a refrigeration system. Oxygen can explode on contact with oil and could result in personal injury or death. When using high pressure gas such as nitrogen for this purpose, ALWAYS USE A PRESSURE REGULATOR that can control the pressure down to 1 or 2 psig. Failure to use a regulator will result in extremely high pressure which could exceed the burst pressure of the compressor or other system components and result in personal injury or death. See Hazard Levels, page 2.

WARNINGS

For your safety, wear eye protection, gloves, and protective clothing when handling refrigerant and oil and when brazing. Have a fire extinguisher nearby. See Hazard Levels, page 2.

Compressor Handling

Do not lift compressor by copper tubing. To prevent internal damage, compressors ***must ALWAYS be held upright.***

The following instructions include major points of consideration that will ensure proper installation and protect you from potential personal injury. Please use the following 13 steps as a checklist, taking each item in order before proceeding to the next. If more information is required, contact the Reznor Service Department for Reznor® products.

WARNING

To avoid electrical shock, power to the com-pressor(s) MUST REMAIN OFF during performance of Steps 1 through 9 below. LOCK DISCONNECT SWITCH OFF (open).

☐ ***Step 1.*** **Verify Proper Application**

Verify that the replacement compressor is identical to the model being replaced. All system components are matched to the compressor. Replacing a compressor with a model other than the one specified for replacement will void the product warranty. See part numbers for R-410A compressors on page 13.

☐ ***Step 2*****. Determine Cause of Initial Failure and Remove the Compressor**

In order to prevent a second failure, the cause of the original failure must be determined. Identify the cause and make the necessary repairs.

CAUTION: DO NOT LIFT compressor by copper tubing; damage will occur. Compressor must remain upright.

WARNING

Wear eye protection and gloves when handling refrigerant or oil and when brazing.

a) ***BEFORE*** **REMOVING THE FAULTY COMPRESSOR,** remove refrigerant charge using proper recovery procedures. Call 1-800-441-9450 for the name of the nearest Dupont authorized distributor or 1-800-ASK-KLEA (IGI) for information on their refrigerant reclaim programs.

b) Disconnect wires. All compressor wiring is connected using a black molded plastic plug. Remove the plug from the compressor.

c) Open access ports so that pressure does not build up in the system. Before unbrazing stubs from the compressor, cut suction and discharge tubing with a tubing cutter.

WARNING

Have a fire extinguisher near. The compressor contains oil. There is a risk of fire when unbrazing stubs.

Use a high temperature torch to disconnect the suction line and the discharge line from the compressor.

d) Remove the mounting bolts and the compressor. Save the mounting hardware to attach the grommets and sleeves shipped with the replacement compressor.

e) To test for acid and to assure excess oil does not remain in the circuit, remove oil from the failed compressor. Measure the amount of oil.

CAUTION: In addition to the required eye protection and gloves, care should be taken in handling POE oil because it may cause damage to certain plastics and roofing materials. See Hazard Levels, page 2.

3.6 Compressor Maintenance (cont'd)

☐ **Step 2. Determine Cause of Initial Failure (cont'd)**

Compressor Oil Charge (POE Oil)

Compressor Model	cc	oz
ZP57K3E	1538	52
ZP83KCE	1656	56
ZP120KCE	3135	106
ZP182KCE	3135	106

Important NOTES: These R-410A compressors use a polyolester (POE) lubricant. Types of recommended POE oil are Copeland Ultra 22 CC, Copeland Ultra 32 CC, Copeland Ultra 32-3MAF, Mobil EAL™, Arctic 22 CC, Uniqema Emkarate RL32CF, or Uniqema RL32-3MAF.

POE oil absorbs moisture much quicker and to a greater degree than standard mineral oil. The compressor must not be left open longer than 15 minutes during replacement. During installation the system must be swept with an inert gas such as dry nitrogen to keep moisture from entering the compressor and prevent the formation of oxides.

If the oil taken from the compressor and measured is found to be significantly lower than listed in **the table above**, clean the excess oil through use of suction and liquid line filter driers. **Beginning in Step 4, follow the same procedure as for burnout cleanup.**

Use an acid test kit to check the oil for acid. **If acid is found, beginning in *Step 4*, follow procedures indicated for burnout cleanup**.

Dispose of oil and compressor using an approved environmentally safe disposal method.

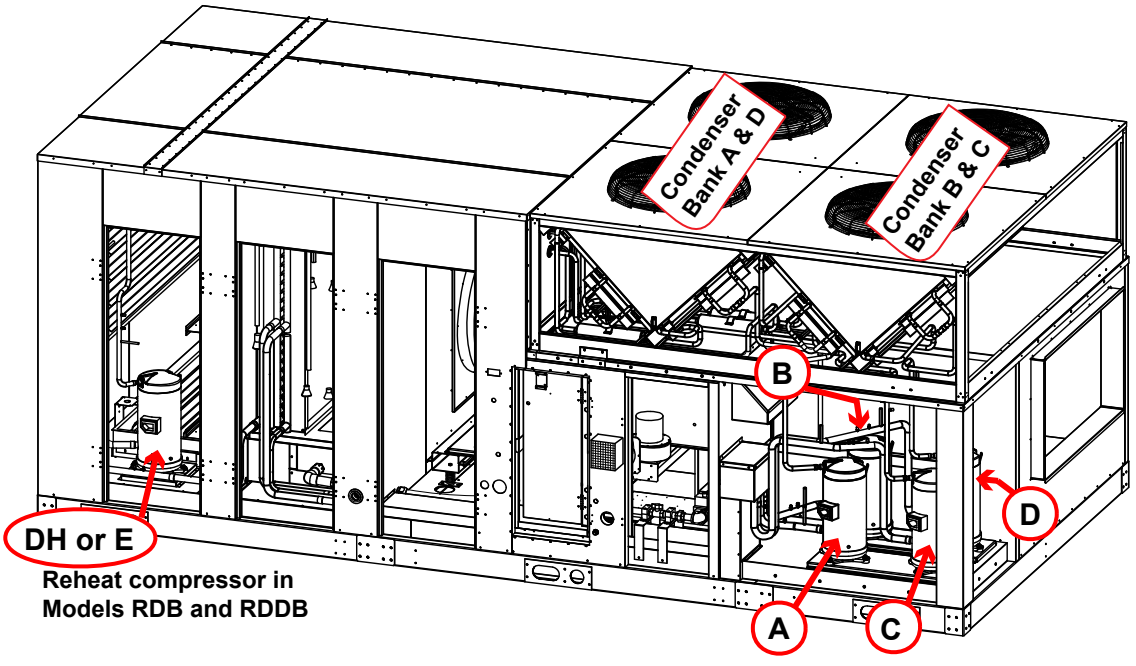
☐ *Step 3*. Mount the Replacement Compressor

Do not remove the dust cover or rubber shipping plugs until all other system connections are complete (i.e. new liquid line filter drier(s) installed and all tubing changes made - see *Steps 4 and 5*). The amount of time the compressor is open to the atmosphere must be kept to a minimum.

Use the new mounting grommets and sleeves that are shipped with the compressor to mount it. The sleeves will prevent over compression of the grommets. Re-use the mounting bolts from the compressor that was removed. The mounting bolts will bottom out when tight.

FIGURE 5 - Identification of Compressors by Location

Compressor



Compressor Staging for Cooling (applies to Models RCB, RDB, RDCB, RDDB RECB, REDB)

MAPSIII Cabinet D	Compressor		Cooling Staging							
	Circuit	Tonnage	1	2	3	4	5	6	7	8
360 418 444 484	A	10	C	A	A+C	D	C+D	A+C+D		
	C	5								
	D	15								
	DH or E (RDB/RDDB/REDB 418)	5								
	DH or E (RDB/RDDB/REDB 444)	7								
	DH or E (RDB/RDDB/REDB 484)	10								
480 538 564 602	A	10	A	D	A+D	C+D	A+C+D			
	C	15								
	D	15								
	DH or E (RDB/RDDB/REDB 538)	5								
	DH or E (RDB/RDDB/REDB 564)	7								
	DH or E (RDB/RDDB/REDB 602)	10								
600 658 684 722	A	10	B	D	A+B	A+D	C+D	A+B+D	B+C+D	A+B+C+D
	B	10								
	C	15								
	D	15								
	DH or E (RDB/RDDB/REDB 658)	5								
	DH or E (RDB/RDDB/REDB 684)	7								
	DH or E (RDB/RDDB/REDB 722)	10								
720 804 842	A	15	B	B+C	B+C+D	A+B+C+D				
	B	15								
	C	15								
	D	15								
	DH or E (RDB/RDDB/REDB 804)	7								
	DH or E (RDB/RDDB/REDB 842)	10								

Compressor Model and P/N by Tonnage and Voltage

Compressor Model	ARI Tonnage	Compressor P/N			
		208V	230V	460V	575V
ZP57K3E	5	216686	216686	216687	216688
ZP83KCE	7	216689	216689	216690	216691
ZP120KCE	10	216695	216695	216696	216697
ZP182KCE	15	216454	216454	216455	216456
Wiring Harness	One each for each compressor	P/N 223028		P/N 223029	P/N 223030
Crankcase Heater		P/N 216402		P/N 216404	P/N 216405

☐ ***Step 4*. Install New Filter Driers** (Select procedure that applies.)

IF the oil measured in ***Step 2*** was not significantly less than the amount shown in the table on page 12 or the test for acid in ***Step 2*** **did NOT indicate burnout**, install a new R-410A refrigerant liquid line filter drier. The filter drier must be rated for no less than 600 psig and be the proper size for the circuit. Because R-410A refrigerant requires POE oil which absorbs moisture quickly, it is important to change the filter drier any time the circuit is opened.

It is recommended to use a tubing cutter when cutting out a filter drier as the desiccant absorbs and holds moisture better when it is cool. Heat from a torch may cause moisture to leave the filter and be absorbed in the oil. Be careful to keep dirt, filings, and other contaminants out of the system.

Continue to ***Step 5***.

IF the oil measured in ***Step 2*** was significantly less than shown in the table on page 12 or the test for acid in ***Step* 2 did indicate compressor burnout**, do the following:

a) Install a liquid line filter drier. **If there is acid**, install an acid removing filter drier. Size the acid-removing filter drier at least one capacity size larger than normally required for the circuit.

b) Install a temporary filter drier in the suction line. When there is acid, a 100% activated alumina suction filter drier is recommended. The suction line drier should be sized properly for the circuit and have a service access fitting to

☐ ***Step 4*. Install New Filter Driers** (cont'd)

monitor pressure drop across the drier. (**NOTE**: Suction line filter drier **must** be removed after 72 hours of operation.)

Step 12 includes the remaining procedures required for cleanup of a burnout. Continue to ***Step 5***.

☐ ***Step 5*. Braze on Suction and Discharge Lines**

CAUTION; Do not leave system open to the atmosphere any longer than minimum required for installation. POE oil in the compressors is extremely susceptible to moisture absorption. Always keep ends of tubing sealed during installation. See Hazard Levels, page 2.

Brazing materials must be able to withstand the high pressure of R-410A refrigerant. A high temperature, silver phosphate type brazing with 5% or greater alloy is recommended.

To prevent oxidation, purge tubing with 2-3 psig of regulated dry nitrogen while it is being brazed. Open the service valve as needed to release the nitrogen. Do not allow moisture to enter the system.

The installer is responsible for brazing and for complying with appropriate standard refrigerant piping procedures.

CAUTION: All brazing should be done using a 2 to 3 psig dry nitrogen purge flowing through the pipe being brazed. See Hazard Levels, pg 2.

CAUTION: When brazing, protect all painted surfaces and components from excessive heat. Wet wrap all valves but do not allow moisture to enter the tubing. See Hazard Levels, page 2.

☐ ***Step 6*. Check System for Leaks**

After installation is complete, pressurize the circuit to approximately 75 psig using nitrogen and a few ounces of refrigerant. Check for leaks using soap bubbles or other leak-detecting methods.

☐ ***Step 7*. Evacuate the Circuit**

Evacuate one circuit at a time. Use a vacuum pump and micron gauge. Each circuit must be evacuated to hold a 500 micron vacuum. Vacuum must be pulled on both the discharge (high) and suction (low) side. Do the suction side first; and the compressor discharge side second. To establish that a circuit is leak-free and moisture-free, a standing vacuum test is recommended. Close off the valve to the vacuum pump and observe the micron gauge. If the vacuum gauge does not rise above 500 microns in one minute, the evacuation should be complete. If the vacuum gauge does rise above 500 microns in one minute, evacuation is incomplete or the circuit has a leak. Repeat as needed until evacuation is complete. The evacuation process must be done on each circuit.

NOTE: Evacuation will not remove moisture from POE oil. Moisture must be prevented from getting in the oil.

Continue and/or repeat ***Steps 6 and 7*** until evacuation is complete.

CAUTION: Do not use the replacement compressor as an evacuation assist and *never* apply voltage to a compressor while it is in a vacuum. See Hazard Levels, page 2.

Moisture and air are harmful to the system because they increase the condensing temperature, raise the discharge gas temperature, cause formation of acids, and cause oil breakdown.

CAUTION: Do not leave a circuit open to the atmosphere any longer than minimum required for installation. POE oil in the compressor is extremely susceptible to moisture absorption. Evacuation will not remove moisture from POE oil.

☐ ***Step 8***. Check the Electrical System

After the system has been evacuated, reconnect the electrical plug to the compressor or the wires to the compressor terminals. It is a normal practice to replace all starting components any time a compressor is changed.

WARNING

Do not apply voltage to the compressor when the plug is removed or terminals disconnected.

Crankcase Heater - Connect the crankcase heater. The crankcase heater is energized continuously and is extremely important to proper compressor operation and long life.

The crankcase heater must be energized for at least 24 hours before starting the unit or after a power outage of more than 8 hours. Be sure to disable cooling controls before turning on power to warm up crankcase heaters.

CAUTION: Crankcase heaters must be allowed to warm up for at least 24 hours prior to startup. Disable cooling controls before turning on power to warm up crankcase heaters.

☐ ***Step 9***. Charge the System (Use R-410A refrigerant only.)

Refer to the table on page 16 for the approximate amount of refrigerant required and follow the instructions below to charge the circuit. R-410A refrigerant MUST BE charged as a LIQUID.

NOTE: Outdoor temperature must be between 70-95°F (21-35°C) for verifying superheat and subcooling. If temperature is not within this range, consult the factory service department before charging.

If equipped with an optional hot gas bypass valve, disable the hot gas bypass valve before charging. The method of disabling the bypass valve depends on whether or not there is a shutoff valve in the line between the compressor discharge and the hot gas bypass valve.

If there is a shutoff valve in the line between the compressor discharge and the hot gas bypass valve, close the shutoff valve. When measurements are complete, open the valve.

If there is not a shutoff valve in the line between the compressor discharge and the hot gas bypass valve, disable the bypass by removing the cover from the bypass valve and adjusting the spring tension. Count and record the number of counterclockwise turns until the spring tension is relieved. (When ready to return the bypass valve to its original setting, turn the spring the same number of turns clockwise. To check setting, see instructions in Paragraph 3.9.5.)

IMPORTANT: *Do not release refrigerant to the atmosphere!* If required service procedures include the adding or removing of refrigerant, the qualified HVAC service technician must comply with all federal, state or provincial, and local laws.

Liquid charge the high side to 80%. With the system running, add the balance of the charge to the correct superheat and subcooling values. Refer to ***Step 11***, page 17, and the instructions in Paragraph 3.5, page 9.

3. Maintenance/ Service Procedures (cont'd)

3.6 Compressor Maintenance (cont'd)

☐ ***Step 9***. Charge the System (cont'd))

Approximate R410-A Refrigerant Charge (lbs) by Model Size and Compressor for Each Circuit (See **FIGURE 5**, page 12, to identify location.)

D Cabinet Models and Size	Compressor Circuit				
	A	B	C	D	E or DH
RCB/RDCB/RECB 360	10.0	N/A	13.0	6.0	N/A
RCB/RDCB/RECB 480	10.0	13.0	13.0	N/A	N/A
RCB/RDCB/RECB 600	10.0	10.0	13.0	13.0	N/A
RCB/RDCB/RECB 720	13.0	13.0	13.0	13.0	N/A
RDB/RDDB/REDB 418	10.0	N/A	13.0	6.0	9.0
RDB/RDDB/REDB 444	10.0	N/A	13.0	6.0	9.0
RDB/RDDB/REDB 484	10.0	N/A	13.0	6.0	11.0
RDB/RDDB/REDB 538	10.0	13.0	13.0	N/A	9.0
RDB/RDDB/REDB 564	10.0	13.0	13.0	N/A	9.0
RDB/RDDB/REDB 602	10.0	13.0	13.0	N/A	11.0
RDB/RDDB/REDB 658	10.0	10.0	13.0	13.0	9.0
RDB/RDDB/REDB 684	10.0	10.0	13.0	13.0	9.0
RDB/RDDB/REDB 722	10.0	10.0	13.0	13.0	11.0
RDB/RDDB/REDB 804	13.0	13.0	13.0	13.0	9.0
RDB/RDDB/REDB 842	13.0	13.0	13.0	13.0	11.0

☐ ***Step 10.*** **System Startup**

Assure voltage to compressor does not drop below minimum allowable voltage (e.g. 187 volts for 230/208-3-60, 415 volts for 460/3/60, 518 volts for 575/3/60) during the period the compressor is trying to start. **If a low voltage or voltage imbalance condition exists, the electrical problem must be determined and corrected prior to operating the unit**.

Voltage Imbalance - Voltage imbalance is becoming a more common problem. In a 3-phase system, excessive voltage imbalance between phases will cause motors to overheat and compressors to fail. Maximum allowable imbalance is 2%. To determine voltage imbalance, measure and record the voltage of all three phases. Take the measurements at the compressor terminals with the compressor operating.

Voltage Imbalance Formula:

Key:	V1, V2, V3 = line voltages as measured
	VA (Average)= (V1 + V2+ V3) / 3
	VD = Line Voltage (V1, V2, or V3 that deviates farthest from average (VA)
Formula:	% of Voltage Imbalance = [100 (VA - VD)] / VA

If the imbalance is within the 2% tolerance, voltage imbalance is not a problem and the system may be operated. If the imbalance exceeds the 2% tolerance, follow the procedures below.

Solutions to Voltage Imbalance:
The cause for a voltage imbalance problem can originate at the power company or can be caused inside the building. Try the following on-site solution to determine if the problem can be easily resolved.

Roll the connections at the compressor terminals one forward. Connect the wire now on Terminal 1 to Terminal 2, 2 to 3, and 3 to 1. Re-measure and re-calculate the voltage imbalance. If the imbalance is within 2%, the system may be operated.

If the imbalance is not within tolerance, roll the connections one more forward. Re-measure and re-calculate the voltage imbalance. If the imbalance is within 2%, the system may be operated. If the voltage imbalance still exceeds 2%, do not start the system. Contact the building owner or person responsible to have an electrician analyze the buildings's power supply and load distribution.

Power Supply Voltage Phasing - Connect refrigerant pressure gauges to the suction and discharge lines of the compressors and an electric meter to the power supply.

CAUTION: Be sure to connect pressure gauges to the suction and discharge lines before system start-up so that compressor rotation can be checked immediately. Scroll compressors will be destroyed if allowed to operate in the wrong direction. See Hazard Levels, page 2.

Record the ambient temperature. Adjust the system controller so that a call for cooling exists.

NOTE: Outdoor ambient lockouts may prevent mechanical cooling. Temporarily override lockouts by lowering the cooling setpoint. When testing is complete, reset the controller.

Because it is possible to unknowingly connect 3-phase power in such a way as to cause the scroll compressor or blower to rotate in reverse, it is very important to check this on startup.

Check Compressors - Immediately at startup, observe the gauges. If the suction pressure rises and discharge pressure drops, the compressor is operating in reverse and must be shut down. Turn off the power and switch the 3-phase line voltage wiring connections before restarting the unit.

(Important NOTE: If allowed to operate for several minutes in reverse, the compressor's internal protector will trip. If a compressor is repeatedly allowed to restart and run in reverse, the compressor will be permanently damaged.)

□ *Step 11*. Check Subcooling and Superheat

Superheat is the verification that the evaporator coil is properly using the refrigerant supplied. Too much superheat indicates that the coil is undercharged. Too little superheat indicates that the coil is overcharged and potentially flooding liquid refrigerant to the compressor.

Subcooling is the measurement of liquid refrigerant stored in the condenser coil. Too much subcooling indicates a system overcharge. Too little subcooling indicates a system undercharge and may not provide the thermal expansion valve with a full column of liquid refrigerant for proper operation.

Two important requirements before checking superheat and subcooling:

1) This unit has fully intertwined refrigerant circuits and each circuit MUST be isolated before measuring its temperature. Another active circuit will influence the reading and make it impossible to determine accurate superheat and subcooling.

2) If equipped with an optional hot gas bypass, disable the hot gas bypass valve before charging. The method of disabling the bypass valve depends on whether or not there is a shutoff valve in the line between the compressor discharge and the hot gas bypass valve.

If there is a shutoff valve in the line between the compressor discharge and the hot gas bypass valve, close the shutoff valve. When measurements are complete, open the valve.

If there is not a shutoff valve in the line between the compressor discharge and the hot gas bypass valve, disable the bypass by removing the cover from the bypass valve and adjusting the spring tension. Count and record the number of counterclockwise turns until the spring tension is relieved. (When ready to return the bypass valve to its original setting, turn the spring the same number of turns clockwise. To check setting, see instructions in Paragraph 3.9.5.)

IMPORTANT: Do not release refrigerant to the atmosphere! If required service procedures include the adding or removing of refrigerant, the qualified HVAC service technician must comply with all federal, state or provincial, and local laws.

3. Maintenance/ Service Procedures (cont'd)

3.6 Compressor Maintenance (cont'd)

☐ ***Step 11***. **Check Subcooling and Superheat. (cont'd)**

Follow the procedures in Paragraph 3.5 to check subcooling and superheat.

☐ ***Step 12*. (Select the procedure that applies.)**

IF the oil measured in ***Step 2*** was significantly less than in the table on page 12 or the acid test in ***Step 2*** indicated a burnout, do the following:

a) Operate the unit for several hours. Check the pressure drop through the temporary suction line filter drier. If the pressure drop exceeds 8 psig, recover the refrigerant, replace the suction line filter drier with the same type as removed, replace the liquid line filter drier, evacuate the circuit, and re-charge with the recovered refrigerant.
Continue to monitor the pressure drop through the suction line filter drier and repeat the process above until the pressure does not exceed 8 psig after several hours of operation. (NOTE: System must be allowed to run no more than 72 hours with a suction line filter drier.)

b) Allow the system to operate for 4-8 hours. Recover the refrigerant and take an oil sample. Retest the oil for acid.

c) If the test for acid is negative, remove the suction line filter drier, replace the liquid line drier, evacuate, and re-charge the system with the recovered refrigerant.
If the test indicates acid, replace both the liquid line filter drier and the suction line filter drier and repeat b) and c).

CAUTION: After cleanup is complete, remove the suction line filter drier. See Hazard Levels, page 2.

d) Verify subcooling and superheat (refer to ***Step 11***).

e) When the system is operating properly, remove the gauges.

IF the oil measured in ***Step 2*** was not significantly less than that shown in the table on page 12 or the acid test in ***Step 2*** did not indicate a compressor burnout, continue to the review in ***Step 13***.

☐ ***Step 13* . Review *ALL Steps* to ensure that nothing was overlooked.**

3.7 Thermostatic Expansion Valves

All refrigeration circuits have a thermostatic expansion valve. Thermostatic expansion valves (TXV's) do not have replaceable parts. If a replacement valve is required, it must be an R410-A valve and be sized correctly for the application. All refrigerant service should be performed by a technician qualified in R410-A refrigerant.
Replacement valves by size and circuit are listed in the following table.

Model & Size	Compressor Circuit	P/N	Sporlan No.	Connection Sizes
RCB/RDCB/RECB 360 RDB/RDDB/REDB 418/444/484	A	220556	BBIZE-8-GA	5/8x7/8x1/4
	C	234987	BBIZE-4-GA	1/2x7/8x1/4
	D	220558	BBIZE-15-GA	7/8x1-1/8x1/4
	E or DH (RDB/RDDB/REDB 418 only)	234987	BBIZE-4-GA	1/2x7/8x1/4
	E or DH (RDB/RDDB/REDB 444 only)	220555	BBIZE-6-GA	5/8x7/8x1/4
	E or DH (RDB/RDDB/REDB 484 only)	220556	BBIZE-8-GA	5/8x7/8x1/4
RCB/RDCB/RECB 480 RDB/RDDB/REDB 538/564/602	A	220556	BBIZE-8-GA	5/8x7/8x1/4
	C	220558	BBIZE-15-GA	7/8x1-1/8x1/4
	D	220558	BBIZE-15-GA	7/8x1-1/8x1/4
	E or DH (RDB/RDDB/REDB 538 only)	234987	BBIZE-4-GA	1/2x7/8x1/4
	E or DH (RDB/RDDB/REDB 564 only)	220555	BBIZE-6-GA	5/8x7/8x1/4
	E or DH (RDB/RDDB/REDB 602 only)	220556	BBIZE-8-GA	5/8x7/8x1/4

Model & Size	Compressor Circuit	P/N	Sporlan No.	Connection Sizes
RCB/RDCB/RECB 600 RDB/RDDB/REDB 658/684/722	A	220556	BBIZE-8-GA	5/8x7/8x1/4
	B	220556	BBIZE-8-GA	5/8x7/8x1/4
	C	220558	BBIZE-15-GA	7/8x1-1/8x1/4
	D	220558	BBIZE-15-GA	7/8x1-1/8x1/4
	E or DH (RDB/RDDB/REDB 658 only)	234987	BBIZE-4-GA	1/2x7/8x1/4
	E or DH (RDB/RDDB/REDB 684 only)	220555	BBIZE-6-GA	5/8x7/8x1/4
	E or DH (RDB/RDDB/REDB 722 only)	220556	BBIZE-8-GA	5/8x7/8x1/4
RCB/RDCB/RECB 720 RDB/RDDB/REDB 804/842	A	220558	BBIZE-15-GA	7/8x1-1/8x1/4
	B	220558	BBIZE-15-GA	7/8x1-1/8x1/4
	C	220558	BBIZE-15-GA	7/8x1-1/8x1/4
	D	220558	BBIZE-15-GA	7/8x1-1/8x1/4
	E or DH (RDB/RDDB/REDB 804 only)	220555	BBIZE-6-GA	5/8x7/8x1/4
	E or DH (RDB/RDDB/REDB 842 only)	220556	BBIZE-8-GA	5/8x7/8x1/4

3.8 Dampers and Damper Controls

Service: Other than external cleaning, there is no service required on the dampers or the damper motor. If the damper, control, or motor need to be replaced, replace with a factory-authorized replacement.

For additional information on damper controls (Options GF 1-9), see the system installation manual Form I-MAPSIII Cabinet D.

Inlet Air Dampers

Location: Dampers and damper motors are located in the inlet air opening.

Function: Dampers operate in response to the control selected. Damper controls are shown below.

Service: Clean dampers and controls of dust and dirt.

Damper Motor

2-Position Damper Motor (Option AR8)

Function: The 2-position damper motor opens and closes the dampers in response to unit operation or a field-supplied time clock.

Motor closes dampers on heater shutdown.

Modulating Motor (Option AR25)

Function: The modulating damper motor actuates the dampers in response to I/Q control with actuation from input switch settings, a remote potentiometer, building pressure, CO2, 2-position outside air enthalpy, or dual reference enthalpy. Motor closes dampers on heater shutdown.

3.9 Other Controls

Other factory-installed standard and optional controls are illustrated below. Find their location in **FIGURE 1**, page 4. Cleaning external dirt is the only service procedure. If any need to be replaced, use only factory-authorized replacement parts.

NOTE: Refer to Control Instruction Form CP-MAPSIII D15/D16 for information on the programmable controller.

3.9.1 Programmable Digital Controller and Sensors

Display

I/Q System Controller

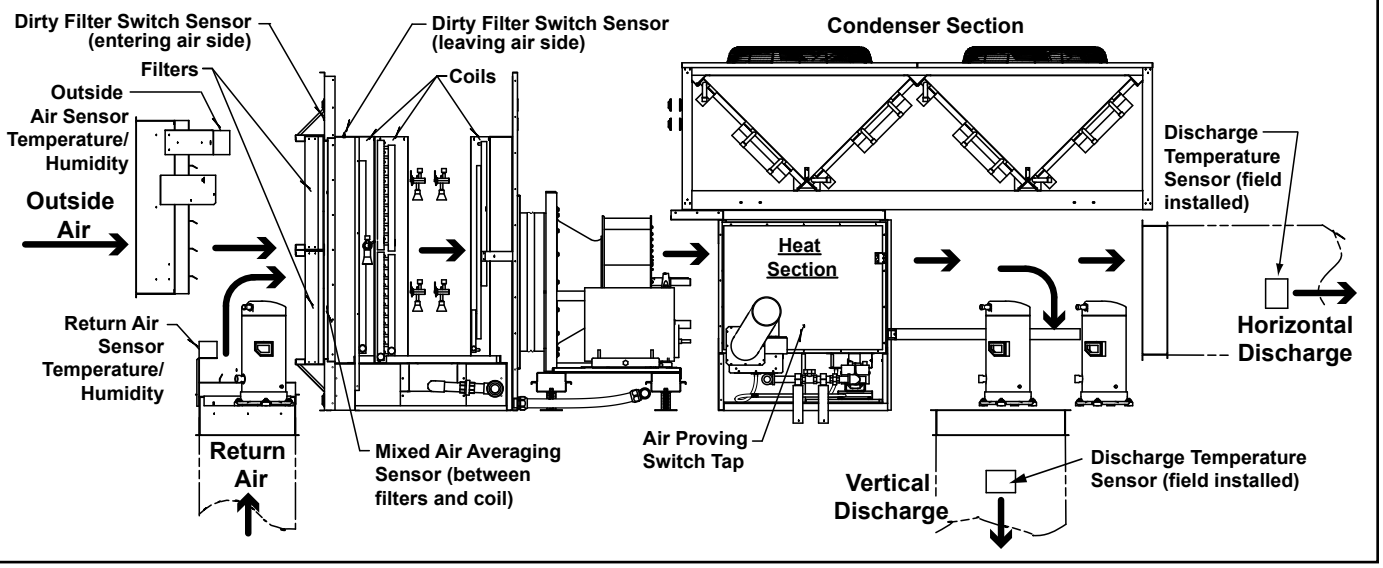
All MAPSIII systems have a unit-mounted, 24-volt programmable I/Q controller.

Depending on how it was ordered, the system is equipped for either neutral air/discharge air control (Option D15) or space control with discharge air reset (Option D16). The controller is factory programmed to match the selection. See the control instruction manual for more information.

Some sensors are standard and others will depend on option selection.

3.0 Maintenance Procedures (cont'd)
3.9 Other Controls (cont'd)
3.9.1 Programmable Digital Controller and Sensors (cont'd)

FIGURE 6 - Airflow and Sensor Locations



Service: If a sensor needs to be replaced, use only a factory authorized replacement part designed for the purpose. Refer to the digital wiring requirements in Paragraph 7.4 of Installation Form I-MAPSIII&IV).

If a controller needs to be replaced, it must be replaced with the same controller and software.

3.9.2 Air Proving Switch

Function: The airflow proving switch is a pressure switch that verifies to the main controller that the blower (plenum fan) is operating.

Service: If the switch needs to be replaced, use a factory-authorized replacement designed for the application.

3.9.3 Motor Starter (Option AN10) or Variable Frequency Drive (Option VFD1 or VFD2)

Function: When the main controller calls for blower operation, either an IEC type starter with a contactor or a variable frequency drive module responds to operate the motor.

The starter is in the high voltage control compartment. The variable frequency drive was field installed in a location that is no more than 50 feet (15M) away where the minimum temperature is 18°F (-9°C). Control of the variable frequency drive module is coordinated with the main controller, and depending on what was ordered, can function in response to temperature, CO2, or pressure controls.

Service: If a starter or contactor need replaced, use only the identical replacement that is designed to match the motor and voltage of the system.

If a VFD needs to be replaced, contact the factory service department. Be prepared to provide the model, serial, and wiring diagram numbers.

3.9.4 Voltage Protection, Option PL4

Function: Phase loss and low or high voltage can cause damage to electrical components. This safety control monitors phase loss and voltage and shuts down the unit when its limits are exceeded. The device is auto reset and allows the unit to restart when the power conditions are corrected.

3.9.5 Hot Gas Bypass Valve, Option AUC9

Bypass valve

Function: The hot gas bypass valve allows some of the refrigerant gas from the suction line to be re-routed directly to the evaporator coil providing for expanded compressor modulation at low outside air temperatures.

Service: To check the hot gas bypass valve setting, connect a pressure gauge to the suction line and block the entering air to the evaporator coil. Suction pressure will drop, and the hot gas bypass valve should begin to open at a approximately 115 psi and will be fully open at 95 psi. When the valve begins to open it will be hot to the touch (see caution below).

CAUTION: Touching the operating hot gas bypass valve can cause a burn. Use caution when checking and adjusting the valve. See Hazard Levels, page 2.

If a hot gas bypass valve needs to be replaced, use only a factory-authorized replacement for R410-A refrigerant. All refrigerant service should be done by a qualified R410-A service technician.

3.9.6 Modulating Reheat, Option AUR1

Function: Units with modulating reheat control (Option AUR1) have a temperature control board with a potentiometer, an air temperature sensor, and an electric discharge bypass valve. When reheat is active, the sensor monitors the air temperature as it leaves the reheat coil. Based on the potentiometer setpoint, the board will open or close the bypass valve. If the leaving air temperature is higher than the setpoint, the board will open the valve adding refrigerant hot gas to the refrigerant liquid before it enters the pre-cool coil. This reduces the coil's ability to absorb the heat, and thus, the reheat coil's ability to reject. If the leaving air temperature is lower than the setpoint, the opposite occurs.

Service: Check the wiring connections at the board. The board is polarity sensitive; positive connects to terminal 1 and negative to terminal 2.

The valve may be tested by measuring the resistance of the leads. Remove the power and the leads from the board before testing. Resistance between the black and white leads should be about 75 Ohms. Resistance between the green and red leads should be within 5% of the white and black.

Use only factory-authorized replacement parts.

4.0 Gas Heat Section Maintenance - Models RDCB and RDDB

This gas heater will operate with a minimum of maintenance. To ensure long life and satisfactory performance, a heater that is operated under normal conditions should be inspected and cleaned at the start of each heating season. If the heater is operating in an area where an unusual amount of dust or soot or other impurities are present in the air, more frequent maintenance is recommended.

When any service is completed, be careful to reassemble correctly to ensure that no unsafe conditions are created. When re-lighting, always follow the lighting instructions on the furnace.

WARNING

Turn off the power before performing maintenance procedures. Lock disconnect switch in OFF position. When you turn off the power supply, turn off the gas at the external manual valve. See Hazard Levels, page 2.

4.1 Heat Exchanger, Burner, and Venter Maintenance

This gas heat section is equipped with a TCORE^{2}® style heat exchanger and burner. Inspect the gas heat section annually to determine if cleaning is necessary. If there is an accumulation of dirt, dust, and/or lint, clean the compartment.

CAUTION: Use of eye protection is recommended.

4.1.1 Instructions for Inspecting/Cleaning a Heat Exchanger

1. Shut off the gas supply.
2. Turn off electric power supply.
3. Open the gas heat section access door and the blower section door.
4. Remove the venter motor and wheel assembly. (See **FIGURES 7 and 8.**)
   a) At the control board, locate the two or three venter motor wires. Mark and disconnect the wires.

4.0 Gas Heat Section Maintenance (cont'd)

4.1 Heat Exchanger, Burner, & Venter Maintenance (cont'd)

FIGURE 7 - View of the Heat Section showing Access to the Heat Exchanger by Removing the Venter Assembly and the Heat Exchanger Access Panel

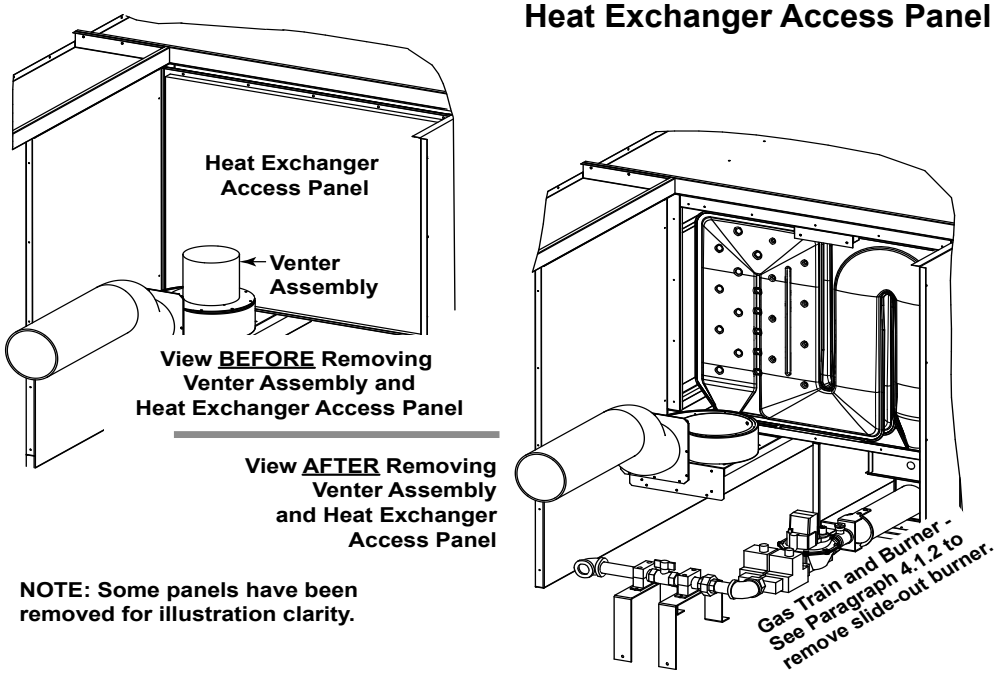
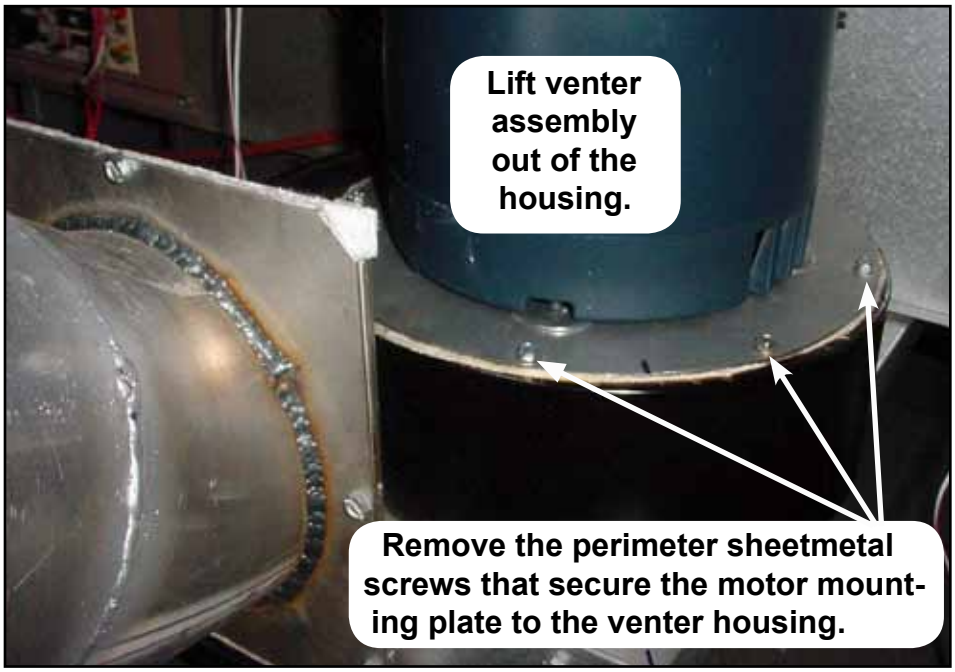


FIGURE 8 - Remove the Venter Assembly before Removing the Heat Exchanger Access Panel



NOTE: To clean the venter assembly while it is removed, follow the instructions in Paragraph 4.1.3.

b) Locate the screws shown in **FIGURE 8.** Remove the screws and carefully lift the venter wheel out of the housing. Remove the whole motor and wheel assembly including the large mounting plate.

NOTE: To clean the venter assembly or replace parts, follow the instructions in Paragraph 4.1.3.

5. With the venter motor and wheel assembly removed, the large heat exchanger access panel is now removable (See **FIGURE** 7). Disconnect the limit switch wires. Remove the screws securing the heat exchanger access panel and remove the panel.

6. The outside of the heat exchanger is now in view here and through the blower door. Remove any external dirt or dust accumulation. Use a 60" inspection mirror to view the heat exchanger sections. Check the heat exchanger for cracks or holes. If a crack or hole is observed, replace the heat exchanger.

With the burner removed in Paragraph 4.1.2, shine a light into each heat exchanger section. With the light shining into the heat exchanger, observe the outside for visible light. Repeat this procedure with each heat exchanger section. If any light is observed, replace the heat exchanger.

If it is determined that the heat exchanger needs to be replaced, contact your distributor or representative for replacement information.

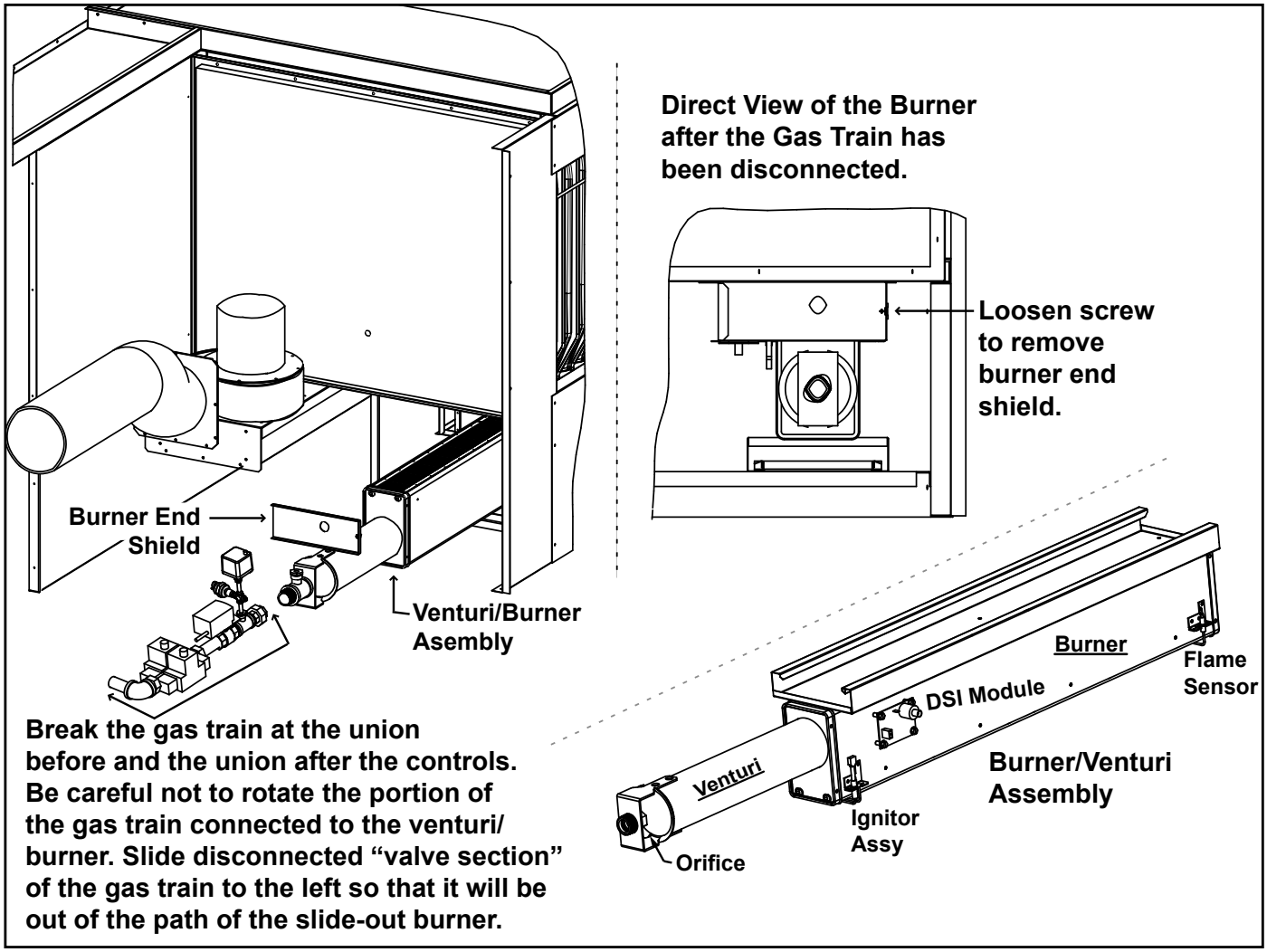
4.1.2 Instructions for Inspecting / Cleaning the Burner

NOTE: With the burner removed, it is possible to check the bottom of the heat exchanger. See Paragraph 4.1.1

The burner will slide out of the unit. Refer to **FIGURE 9** and follow the instructions below to remove and inspect the burner

1. Disconnect the gas train at the two unions showing in **FIGURE 9**. Do not allow the portion of the gas train attached to the venturi tube to rotate.
   Slide the "free" section of gas train that includes the valves to the left out of the path of the slide-out burner. Do not disconnect the valve wires.
2. Loosen the screw holding the burner end shield. Remove the burner end shield with the screw attached.
3. The burner is designed to slide out of the heater for inspection and/or service. Remove the screws above and below holding the burner assembly. Carefully pull the burner assembly (with pipe nipple attached) partially out of the cabinet. To completely remove the burner, mark and disconnect the sensor wires and the igniter and igniter board wires, and slide the burner out.
4. With the burner assembly removed, shine a flashlight on the burner ribbons. Look for carbon buildup, scale, dust, lint, and/or anything that might restrict flow through the spaces between the burner ribbons. Holding the burner assembly so that any foreign material will fall away from the burner, use a stiff bristle brush to loosen and remove any foreign material(s). If the burner is excessively dirty, remove both

FIGURE 9 - Remove the Burner/Venturi Assembly



4.0 Gas Heat Section Maintenance (cont'd)

4.1 Heat Exchanger, Burner, & Venter Maintenance (cont'd)

4.1.2 Instructions for Inspecting/Cleaning the Burner (cont'd)

of the burner end caps. Remove the screws that hold the end caps to the burner housing. Lightly tap end caps to remove.

Clean all foreign material from the burner and venturi. After the burner is thoroughly cleaned, replace the end caps making certain that they are tight against the burner housing. **NOTE:** If any of the burner components are damaged or deteriorated, replace the burner assembly.

Ignitor

Check the Ignitor and Flame Sensor

Ignitor - Locate the ignitor. Disconnect the wire; remove the screw and the ignitor. Clean the ignitor assembly with an emery cloth.

Spark gap must be maintained to 1/8". See **FIGURE 10**.

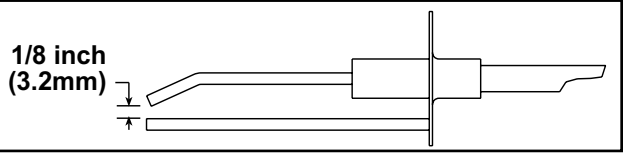
IMPORTANT: When re-assembling, the brown ground wire must remain attached to the ignitor.

CAUTION: Due to high voltage on the spark wire and electrode, do not touch when energized.

Flame Sensor - Locate the flame sensor on the burner. Disconnect the wires; remove the screws and the flame sensor. Clean with an emery cloth.

Flame Sensors

FIGURE 10 - Ignitor showing required Spark Gap Measurement



4.1.3 Maintenance Instructions for the Venter Motor and Wheel

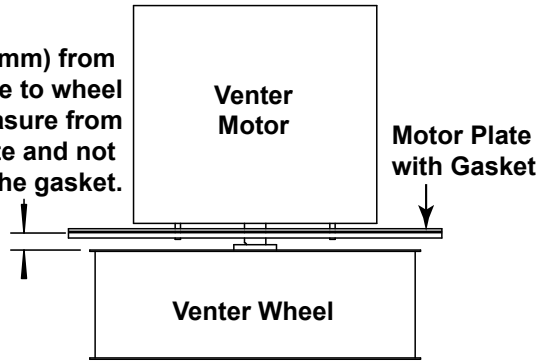
If the venter assembly is not already removed, remove it by following STEPS 1-4 in Paragraph 4.1.1 for accessing the heat exchanger (**NOTE:** It is not necessary to open the blower door.)

Note that during normal operation of the AG70 deep modulation control system, the current draw of the venter motor can exceed the full load amp rating on its nameplate. This condition is common when employing electronic wave-chopping technology to reduce the running speed of a single-phase type PSC alternating current motor. The technology reduces energy to the main winding by momentarily interrupting current for a variable amount of time, resulting in a reduction of the motor speed. The increased current is a result of increased slip, which is the difference between the rotation speeds of the rotor and stator fields. All motors used in MAPS III systems are custom designed and built for this unique modulating application and cannot be replaced with a non-approved motor. All prototype motors have been thoroughly tested with regards to temperature of the windings and bearings at all operating points and ambient conditions and approved by the manufacturer to assure the elevated current does not affect the normal motor life expectancy.

Remove dirt and grease from the venter housing, the motor casing, and the venter wheel. Venter motor bearings are permanently lubricated.

If replacing venter parts, see **FIGURE 11** for proper spacing. If the motor plate gasket is damaged or deteriorated, replace it with **P/N 222856**.

FIGURE 11 - Venter Wheel Position on Shaft



NOTE: Manufacturer recommends replacing venter motor capacitor See **FIGURE 12**.) when replacing venter motor. Use only factory-authorized replacement parts.

4.1.4 Re-Assemble the Heat Exchanger Panel, Burner, Gas Train, and Venter

Instructions to Re-Assemble the Gas Heat Section (Refer back to FIGURES 7, 8, and 9.)

1. **Re-attach the Heat Exchanger Panel -** Re-attach the access panel being sure to use all of the screws. See **FIGURE 7**. Reconnect the limit switch wire.
2. Re-attach the venter assembly using all of the screws removed. See **FIGURE 8**. Re-connect the venter wires at the board. If installing a replacement motor, check the wiring diagram for connections.
3. **Re-install the Burner and Manifold**
   - **a)** Slide the entire venturi/burner assembly into position.
   - **b)** Re-connect the ignitor and sensor wires. Verify that the wires and the connections are good
   - **c)** Insert all of the screws along the top and the bottom. Re-attach the burner end shield.
   - **d)** Re-connect the gas train. Be careful not to rotate the section attached to the venturi/burner. Check the burner orifice to be sure that it is secure and positioned properly.
4. Check the wiring and sensing tube connections. Turn on the electric and the gas. Leak test the connections with a leak detecting solution. Check for proper operation.

4.2.1 General

IMPORTANT NOTE: The information in Section 4.2 applies to standard natural gas MAPSIII D Cabinet Models RDCB and RDDB manufactured beginning 12/2011. A Model RDCB or RDDB manufactured prior to 12/2011 may also have these gas control components. The identification of the ignition board in the Serial No. on the heat section rating plate will determine whether this information applies. If the ignition code in the serial number is 96, the information in Section 4.2 applies. If the ignition code is 90, 91, 92, or 93, contact your representative or distributor or search RezSpec.com for a previous version of this manual.

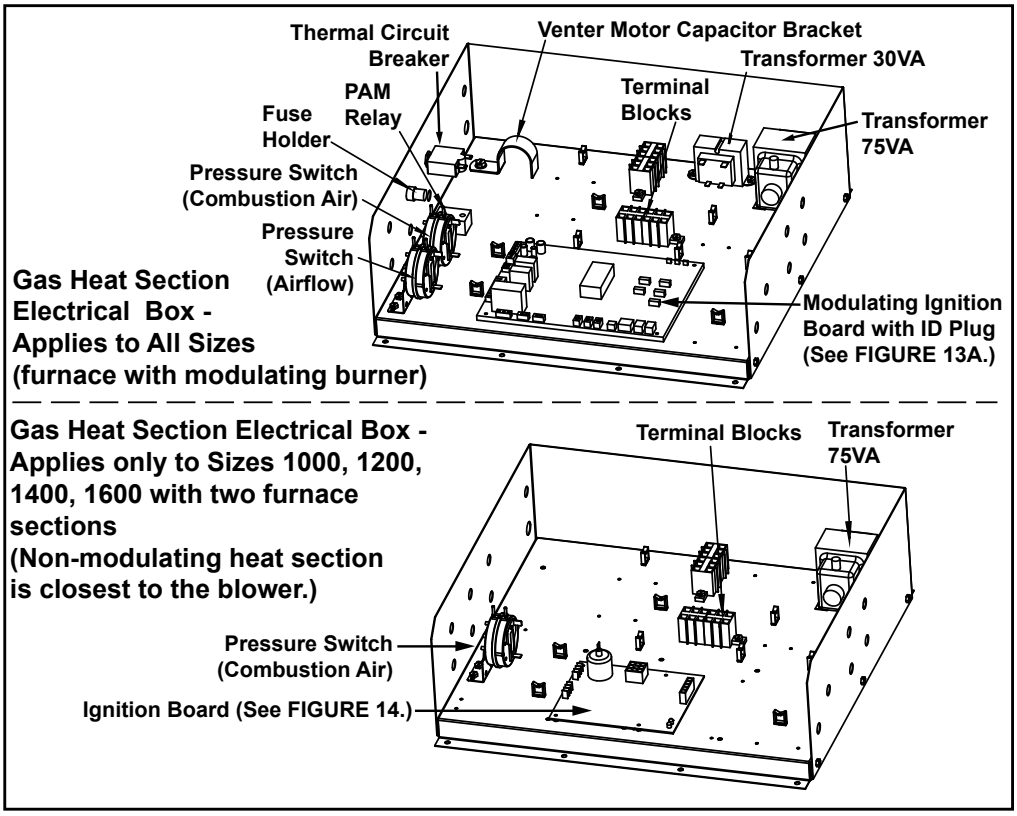
Serial No. Sample: 3 BKH 789 BK 08 N **96** 7D

Also, if the unit is propane ("N" in the Serial No. is an "L"), modulation control information here does not apply. Refer to the rating plate or contact your distributor for information.

FIGURE 12 - Gas Heat Section Controls in a MAPSIII "D" Cabinet

The heat section controls are located on the floor of the heat section; .see **FIGURE 1**, page 4.)

NOTE: Configuration of heat sections in relation to the blower depends on date of manufacture. Currently manufactured systems with two heat sections have the non-modulating furnace closest to the blower and the modulating furnace downstream. Previously manufactured systems may have the opposite configuration.



4. Gas Heat Section Maintenance (cont'd)

4.2 Gas Heat Section Controls

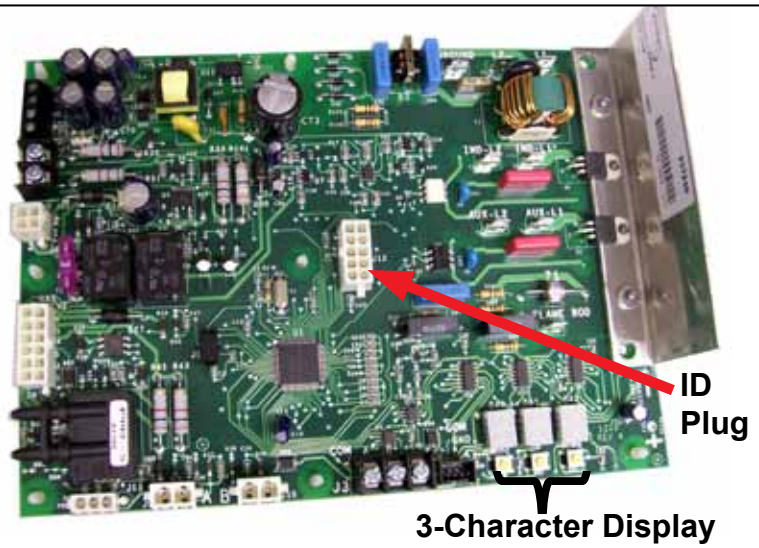
4.2.2 Ignition System (Natural Gas only)

The modulating furnace has the control module in the control compartment (**FIGURES 12 and 13A**) with an additional board (**FIGURE 13B**) attached directly to the side of the burner to control spark. Do not attempt to disassemble either board. However, each heating season check the lead wires for insulation deterioration and good connections. If replacement is required, these boards must be replaced with identical parts.

FIGURE 13A - Ignition Control Module (Deep Modulation Board)

IMPORTANT: The control module illustrated is **P/N 257246 used on all MAPSIII Cabinet D** heat sections manufactured beginning 8/2011 and on previously manufactured units as a special. The ID plug on each board is unique for each size of heat section. A replacement board will require either a new ID plug or reuse of the ID plug from the board being replaced.

Standard MAPSIII Cabinet D heat sections manufactured prior to 8/2011 have a unique ignition board by size and do not have a replaceable ID plug.



The control has a built-in, self-diagnostic capability. The control continuously monitors its own operation and the operation of the heat section including direct spark ignition, safety and modulating valves, and venter motor speed. The 3-digit display on the control indicates the current system state, warnings, failures, and test modes.

NOTE: Operating and Lockout Error Codes displayed on ignition controller 3-character display (**FIGURE 13A**) are listed in Troubleshooting Paragraph 7.3.3.

Controller LED Information (displayed on power up)	
Display Info (example only)	Description
D CAb	Furnace series or model name, for example, "D cabinet series"
500	Heat Section Size
nAt	Fuel type
1.01	Software version

Normal Furnace Operation (LED 3-Character Display in FIGURE 13A)		
LED Display	Heat Mode	Description
OFF	OFF Mode (OFF)	System Idle - Control board has power, no faults found, no call for heat.
Pur	PURGE Mode (Pur)	System is purging the heat exchanger – No gas on, no flame, inducer runs for the specified purge timings. Purge cycles occur immediately before and after each burner operation.
Ign	IGNITION Mode (Ign)	System is initiating burner operation – Igniter energized, modulating valve moved to ignition setting, gas on. Maintained for the trial-for-ignition period and the five second flame stabilization period.
HEA	WARM-UP Mode (HEA)	Period between Ignition and Run – System checks completed before modulation control begins.
run	RUN Mode (run)	Normal modulating operation.
rEt	Ignition Retry (rEt)	System has had a failed ignition attempt or has lost flame during burner operation and is beginning another ignition cycle.

FIGURE 13B - Spark Ignition (DSI) Board, P/N 257975

CAUTION: Due to high voltage on the spark wire and electrode, do not touch when energized. See Hazard Levels, page 2.

Spark Board is attached to the side of the burner.

Modulating Gas Control Sequence of Operation (single heat section sizes and the heat section furthest from the blower on dual heat section sizes - natural gas only)

1) Call for Heat - The IQ controller calls for heat (there is a closure between "R" and "W" and at least 2 VDC to the analog input). The ignition system circuit board will check the modulating valve position and move to lightoff position. It checks to see that the limit switch is closed and the pressure switch is open. If the pressure switch is closed, the circuit board will wait indefinitely for the switch to open. If the switch is open, the circuit board proceeds to prepurge.

2) Prepurge - After the actuator moves to its lightoff position, the circuit board energizes the venter motor and waits for the pressure switch to close. If the pressure switch does not close at the beginning of a heat cycle, the venter motor will run for two minutes, then cycle off for 30 seconds, then on for two minutes, and so forth indefinitely.

When the pressure switch is proven closed, the venter motor ramps up to the appropriate lightoff speed and the circuit board begins the prepurge time. If flame is present any time while in prepurge, the prepurge time is restarted. If flame is present long enough to cause lockout, refer to the Troubleshooting Guide in Paragraph 6.2.2. The ignition system circuit board runs the venter motor for a 30-second prepurge time, then proceeds to the ignition trial period.

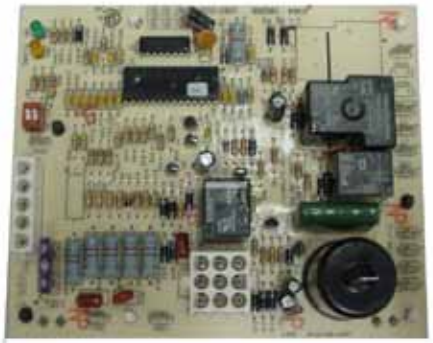
3) Ignition Trial Period - The ignition system circuit board energizes the spark and main gas valve. The venter remains energized. If flame is sensed during the first 6 seconds, the spark is de-energized. If flame has not been sensed during the first 6 seconds, the control de-energizes the spark output and keeps the gas valve energized for an additional one second flame proving period. If flame is not present after the flame proving period, the control de-energizes the gas valve and proceeds with three ignition re-tries as specified in “Abnormal Heat Cycle, Ignition Retry”. If flame is present, the circuit board proceeds to steady heat. After three re-tries, the board will lockout for one hour. It will require a cycling of power to reset before the one-hour limit.

4) Modulating Heat - As long as the call for heat exists, the circuit board not only modulates the gas to precisely meet varying load conditions, but also modulates the combustion air to maintain stable performance and optimize thermal efficiency across the entire modulating range. Circuit board inputs are continuously monitored to ensure limit switch is closed and flame is established. When the call for heat is removed, the ignition system circuit board de-energizes the gas valve and begins postpurge timing.

5) Post Purge - The venter motor output remains on for a 45 second postpurge period after the system controller is satisfied.

Ignition Controller on Non-Modulating Gas-Fired Furnace on MAPS D Sizes 1000, 1200, 1400, or 1600 with Two Furnaces

FIGURE 14 - DSI Integrated Control Module (Ignition Board) used on Non-Modulating Heat Section



Control Status - Green LED Codes

Steady ON	Normal Operation, No call for heat
Fast Flash	Normal Operation, Call for heat
1 Flash	System Lockout, Failed to detect or sustain flame
2 Flashes	Pressure Switch Did Not Close within 30 Seconds of Venter Motor
3 Flashes	High Limit or Flame Rollout Switch Open
4 Flashes	Pressure Switch is Closed Before Venter Motor is Energized
Steady OFF	Blown fuse, No Power, or Defective Board

Flame Status - Yellow LED Codes

Steady ON	Flame is sensed
Slow Flash	Weak flame (current below 1.0 microamps ± 50%)
Fast Flash	Undesired Flame (valve open and no call for heat)

DSI Integrated Control Module (ignition system circuit board) - See **FIGURE 14**. The module is located in the control compartment and monitors the operation of the gas heater including ignition. The green and yellow LED indicator lights flash to indicate normal and abnormal conditions. If the heater fails to operate properly, check these signals to determine the cause and/or to eliminate certain causes. The only replaceable component is the 3 amp Type ATC or ATO fuse. If the fuse is blown, the problem is most likely an external overload. Correct the problem and replace the fuse (field supplied or P/N 201685).

4. Gas Heat Section Maintenance (cont'd)

4.2 Heat Section Controls (cont'd)

4.2.2 Ignition System (cont'd)

Ignition Controller on Non-Modulating Gas-Fired Furnace on MAPS D Sizes 1000, 1200, 1400, or 1600 with Two Furnaces (cont'd)

Do not attempt to disassemble the control module. However, each heating season check the lead wires for insulation deterioration and good connections.

Proper operation of the direct spark ignition system requires a minimum flame signal of 1.0 microamps as measured by a microampmeter.

Normal Heat Cycle Operating Sequence - Non-Modulating Furnace of D Cabinet with Size 1000, 1200, 1400, or 1600 Heat Section

1) Call for Heat - The heating/cooling system controller calls for heat. The ignition system circuit board checks to see that the limit switch is closed and the pressure switch is open. If the limit switch is open, the circuit board responds as defined in the “Abnormal Heat Cycle, Limit Switch Operation”. If the pressure switch is closed, the circuit board will do four flashes on the green LED and wait indefinitely for the pressure switch to open. If the pressure switch is open, the circuit board proceeds to prepurge.

2) Prepurge - The circuit board energizes the venter motor and waits for the pressure switch to close. If the pressure switch does not close within 30 seconds of the venter motor energizing, the circuit board will do two flashes on the green LED. The circuit board will leave the venter motor energized indefinitely as long as the call for heat remains and the pressure switch is open.

When the pressure switch is proven closed, the circuit board begins the prepurge time. If flame is present any time while in prepurge, the prepurge time is restarted. If flame is present long enough to cause lockout, the circuit board responds as defined in “Fault Modes, Undesired Flame”.

The ignition system circuit board runs the venter motor for a 20 second prepurge time, then proceeds to the ignition trial period.

3) Ignition Trial Period - The ignition system circuit board energizes the spark and main gas valve. The venter remains energized. If flame is sensed at the burner during the first 16 seconds, the spark is de-energized. If flame has not been sensed during the first 16 seconds, the control de-energizes the spark output and keeps the gas valve energized for an additional one second flame proving period. If flame is not present after the flame proving period, the control de-energizes the gas valve and proceeds with ignition re-tries as specified in “Abnormal Heat Cycle, Ignition Retry”. If flame is present, the circuit board proceeds to steady heat.

4) Steady Heat - Circuit board inputs are continuously monitored to ensure limit and pressure switches are closed, flame is established, and the system controller call for heat remains. When the call for heat is removed, the ignition system circuit board de-energizes the gas valve and begins postpurge timing.

5) Post Purge - The venter motor output remains on for a 45 second postpurge period after the system controller is satisfied.

Abnormal Heat Cycle Functions - Non-Modulating Furnace of D Cabinet with Size 1000, 1200, 1400, or 1600 Heat Section

Interrupted Call for Heat - If the system controller call for heat is removed before the flame is recognized, the circuit board will run the venter motor for the post purge period and de-energize all outputs.

If the call for heat is removed after successful ignition, the circuit board will de-energize the gas valve and run the venter motor through post purge.

Ignition Retry - If flame is not established on the 1st trial for ignition period, the ignition system circuit board de-energizes the gas valve, and the venter motor remains energized for an inter-purge period of 10 seconds. The spark and gas valve are then re-energized, and the circuit board initiates a 2nd trial for ignition.

If flame is not established on the 2nd trial for ignition, the circuit board de-energizes the gas valve and venter motor remains energized. The spark and gas valve are re-energized and the circuit board initiates a 3rd trial for ignition.

If flame is not established on the 3rd trial for ignition period, the circuit board de-energizes the gas valve, and the venter motor remains energized for an inter-purge period of 10 seconds. The circuit board then re-energizes the gas valve and spark and initiates a 4th trial for ignition.

Ignition System Fault Modes - Non-Modulating Furnace of D Cabinet with Size 1000, 1200, 1400, or 1600 Heat Section

If flame is not established on the 4th trial for ignition (initial try plus 3 re-tries), the circuit board de-energizes the gas valve and goes into lockout. The circuit board goes to one flash on the green LED to indicate ignition failure lockout.

Limit Switch Operation - The limit switch is ignored unless a call for heat is present (W energized). If the limit switch is open and a call for heat is present, the control de-energizes the gas valve and runs the blower motor on heat speed and runs the venter motor. The control will be in soft lockout and flashing fault code "3" before returning to normal operation.

When the switch re-closes or the call for heat is lost, the control runs the venter motor through post purge and the blower through the selected fan off delay.

Pressure Switch - If the pressure switch opens before the trial for ignition period, the venter motor will run through the pressure switch recognition delay (2 seconds), the gas valve will be de-energized, and the venter motor will run through the postpurge time. The ignition system circuit board will re-start the heat cycle at the pressure switch proving state if the call for heat still exists.

Pressure switch opening for less than 2 seconds during the trial for ignition period shall not interrupt the heat cycle. (Gas valve will de-energize while the pressure switch is open.)

If the pressure switch opens after a successful ignition, the circuit board will de-energize the gas valve. If flame is lost before the end of the 2 second pressure switch recognition delay, the circuit board will respond to the loss of flame. If the pressure switch remains open for 2 seconds and the flame remains, the circuit board de-energizes the gas valve and the venter motor runs through postpurge

Undesired Flame - If flame is sensed longer than 20 seconds while the gas valve is de-energized, the circuit board shall energize the venter motor. When flame is no longer sensed, the venter motor will run through postpurge. The circuit board will do a soft lockout, but will still respond to open limit and flame. The FLAME (yellow) LED flashes rapidly.

Gas Valve Relay Fault - If the circuit board senses the gas valve as energized for more than one second when the circuit board is not attempting to energize the gas valve, or the gas valve is sensed as not energized when it is supposed to be energized, then the circuit board will lockout with the green LED off. The control assumes either the contacts of the relay driving the gas valve have welded shut, or the sensing circuit has failed. The venter motor is forced off to open the pressure switch to stop gas flow unless flame is present.

If the gas valve was sensed as closed when it should be open, and has not de-energized after the venter motor was shutoff for 15 seconds, then the venter motor is re-energized to vent the unburned gas.

Soft Lockout - The circuit board shall not initiate a call for heat while in lockout. The circuit board will still respond to an open limit and undesired flame. Lockout shall automatically reset after one hour. Lockout may be manually reset by removing power from the circuit board for more than one second or removing the call for heat for more than one and less than 20 seconds.

Hard Lockout - If the circuit board detects a fault on the board, the status LED will be de-energized, and the circuit board will lockout as long as the fault remains. A hard lockout will automatically reset if the hardware fault clears.

Power Interruption - During a momentary power interruption or at voltage levels below the minimum operating voltage (line voltage or low voltage) the ignition system will self-recover without lockout when voltage returns to the operating range.

Power interruptions of less than 80mS shall not cause the circuit board to change operating states. Power interruptions greater than 80mS may cause the circuit board to interrupt the current operating cycle and re-start.

4. Gas Heat Section Maintenance (cont'd)

4.3 Gas Train

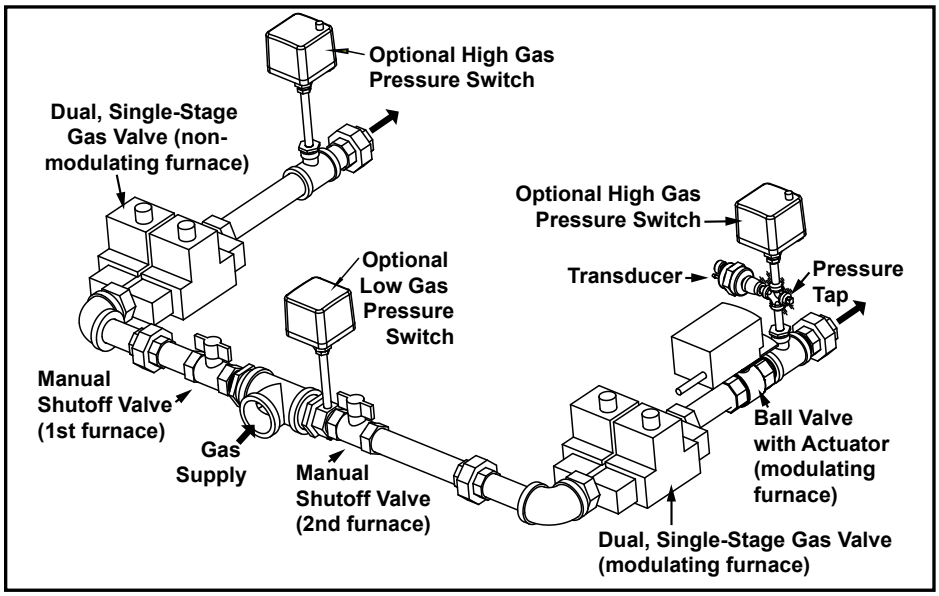
Location: The gas train is visible with the heat section door open. See component identification in **FIGURE 15**.

Service: Carefully remove external dirt from the valves and check the wiring connections. Annually, in preparation for the heating season, check the dual, single-stage operating valve to be sure that it shuts gas flow off completely.

If any gas valves or other gas train components need to be replaced, they must be replaced with identical part or factory-authorized replacement.

FIGURE 15 - Gas Train Components

NOTE: Heat section Sizes 500, 600, 700, and 800 with one furnace have manifold for modulating furnace only.

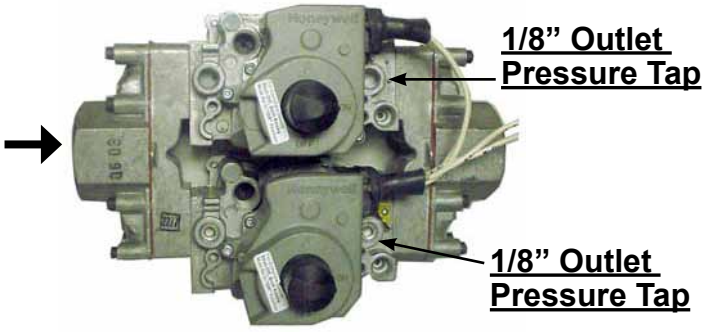


Dual Single-Stage Operating Gas Valve - All gas heat sections have one or two dual single-stage gas valves.

WARNING

he operating valve is the prime safety shutoff. All gas supply lines must be free of dirt or scale before connecting to the unit to ensure positive closure. See Hazard Levels, page 2.

FIGURE 16 - Top View of Dual Single-Stage Gas Valve



The dual single-stage gas valve(s) must be checked annually to ensure that each valve is shutting off gas flow completely.

Instructions:

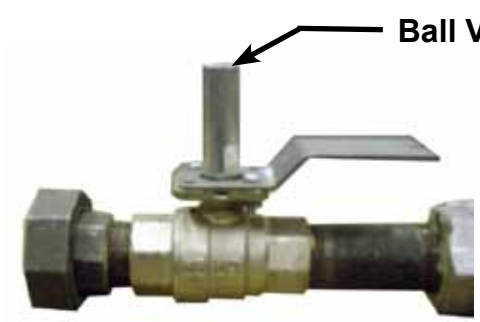
1) Locate the 1/8" NPT pressure taps on the combination valve (see illustration on the left).
2) Turn the manual valve OFF to prevent flow to the manifold. Connect a manometer to both of the 1/8" outlet pressure taps. **NOTE:** Manometers (fluid-filled gauges) with inches water column scale are recommended. Turn the manual valve ON and the heater off.
3) Use your finger to fully block the burner orifice. Continue blocking the orifice for several seconds and observe the manometers. If any pressure is indicated, the gas valve is leaking. A leaking gas valve must be replaced before the heater is put back in operation.
4) Repeat the test with each dual single-stage gas valve.

FIGURE 17 - Ball Valve and Actuator in Modulating Gas Control

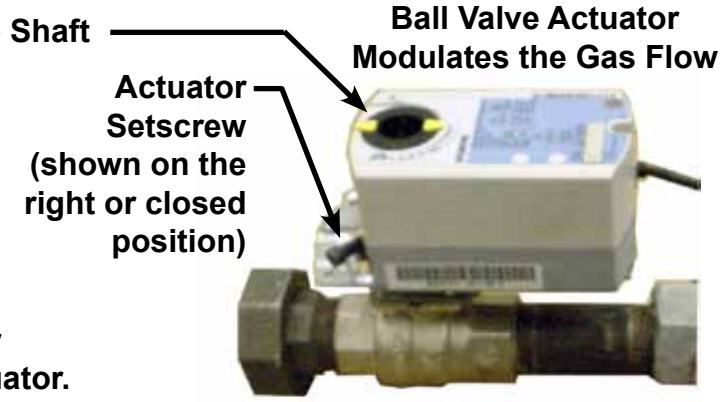
The modulating furnace has a ball valve with an actuator to control gas flow. The ball valve and actuator are located downstream of the dual single-stage valve as shown here.

Carefully clean external dirt accumulation from the actuator.

FIGURE 18 - Ball Valve with Actuator in Modulating Gas Control Manifold



Ball Valve with actuator removed (for illustration only); do not remove actuator.



Modulating System Gas Valve (Ball Valve & Actuator) Adjustment

Inspect the position of the ball valve shaft.

- In the fully open position, the dash marks on the top of the shaft should be aligned with the gas piping.
- In the fully closed position, the dash marks on the top of the shaft should be aligned at a 90° angle across the gas piping.

If the ball valve shaft is not properly aligned or if the manifold pressure does not match the settings in the chart below, the ball valve will need to be adjusted.

FIGURE 19 - Gas Manifold Transducer

Location: See FIGURE 15.

Function: The transducer reads the manifold pressure and sets the venter motor speed to precisely match the designed combustion settings.

Service: If the transducer needs to be replaced, use only a factory-authorized replacement part designed for the purpose.

Manifold Pressures for MAPSIII Cabinet D Gas Modulation System

Manifold Pressure (" w.c.) Measured at the Pressure Tap by the Gas Transducer			
Cabinet and Heat Section Size	Gas Type*	High Setting 100% on ModHeat	Low Setting 0% on ModHeat
D-Cab - All Sizes	Natural	3.4	0.20

***NOTE:** Propane is available on limited sizes with 2-stage gas control only. Manifold pressures (valve output) for those sizes are listed below.

Cabinet and Heat Section Size	Gas Type	High Setting 100% t	Low Setting 50%
D-Cab 1000	Propane	10.0	5.0
D-Cab 1200	Propane	10.0	5.0
D-Cab 1400	Propane	10.0	5.0
D-Cab 1600	Propane	10.0	5.0

Instructions

To check and/or adjust gas modulation:

Checking modulation requires a manometer capable of reading to 0.10" w.c. Connect the manometer as instructed in Step 1.f) below.

To check and adjust the modulation system, the IQ controller must be in **Test Mode**. On the control display in the electrical compartment, follow the steps below to enter **Test Mode**.

a) Scroll down to Menus and press **Enter**.

b) Enter password (0000) using the **INC** button and the right arrow button and press **Enter**.

c) Scroll down to the **Service Menu** and press **Enter**.

d) Scroll down to **Test Mod**e and press **Enter**.

e) Scroll down to **Manual Test**; press **Enter**; press the **INC** button to change the command **from OFF to ON**; and press **Enter.**

f) After the system has completed the shutdown sequence, connect the gas manometer to the manifold pressure tap next to the transducer (See **FIGURES 15** and **19**).

g) On the display, scroll down to **Heat Stg 1** and press **Enter**.

h) Scroll down to **ModHeat** which has a default setting of 100%.

2. With the **ModHeat** set at 100%, measure the manifold pressure. If the manifold pressure matches the High Setting value in the chart above, continue to Step No. 3.

4.0 Gas Heat Section Maintenance (cont'd)

4.3 Gas Train (cont'd)

Modulating System Gas Valve Adjustment Instructions (cont'd)

If the manifold pressure does not match the value in the chart and the ball valve is fully or close to fully open, adjust the pressure screws) on the Honeywell valve (See **FIGURE 16**) until the pressure matches the chart. Adjust both pressure screws so that they are the same. When the manifold pressure measured at the manometer matches the pressure listed in the chart, make a note for future reference of the position of the ball valve stem in relation to the dash marks on the actuator.

3. On the display, change the **ModHeat** setting to 0% modulation and allow the ball valve to go to its lowest setting. Check the manifold pressure on the manometer. If the manifold pressure matches the Low Setting value in the chart, skip to Step No. 4.
   If the manifold pressure does not match the low (0%) value on the chart, the ball valve will need to be adjusted. Follow these steps:
   a) While the unit is still firing at 0% modulation, remove the ball valve actuator. To do this, locate the screw on the rear of the actuator and remove it. Loosen the actuator set screw (See **FIGURE 18**), and carefully remove the actuator by lifting it straight up. Do not disconnect any wires.
   b) Using adjustable pliers, slowly turn the ball valve stem until the manifold pressure on the manometer matches the low setting on the chart.
   Important NOTE: If the valve is adjusted too far closed and the flame goes out, let the unit recycle and then manually open the ball valve to the 100% open position noted in Step No. 2. When the unit is firing at full fire, re-attach the actuator to the ball valve, and repeat the procedure beginning with Step No. 2.
   c) When the manometer readings match the values in the chart and before re-installing the actuator, the burr left on the ball valve stem from the previous set screw setting needs to be removed. Either lightly file the burr on the valve stem to prevent the set screw from returning to the previous position or remove the valve stem, rotate it 180° so that the set screw contacts the opposite side of the stem, and re-install the valve stem.
   d) Re-install the actuator making sure it is level on the ball valve mounting plate.
   e) Re-check the setting by going to full fire (Set **ModHeat** at 100%) and returning to 0% modulation (Set **ModHeat** at 0%). Measure the manifold pressure. The adjusted gas pressure should be close to the value in the chart on page 31. If not, repeat the procedure.
4. When the settings are in agreement with the chart and testing is complete, remove the manometer. Set **ModHeat** to 100%. Scroll the display back to **Test Mode** and press **Enter**. Disable **Test Mode** by pressing the **INC** button to change the command **from ON to OFF**; and press **Enter**.

FIGURE 20 - Optional Gas Pressure Safety Switches

Location: Low pressure switch is at the entrance to the gas train. The high pressure switch is at the burner end. See **FIGURE 15**.

Function: To monitor gas pressure and shut down the heat section if gas pressure becomes too low or too high. The low pressure switch is an auto reset type. The high pressure switch requires manual reset.

Service: The are no replaceable parts and the settings are non-adjustable. If replacement is required, use identical factory-authorized safety switches.

4.4 Other Gas Heat Section Controls

FIGURE 21 - Combustion Air Proving Switch

Location: See **FIGURE 12**, page 25, for location.

Function: If the pressure switch does not sense combustion air flow from venter operation, the controller will shut down heat section operation.

Service: If it is determined that the pressure switch needs replacing, use only the factory-authorized replacement part that is designed for the model and size of gas heater being serviced.

DANGER

Safe operation requires proper venting flow. Never bypass the combustion air proving switch or attempt to operate the heat section without the venter running and proper flow in the vent system. Hazardous condition could result. See Hazard Levels, page 2.

Switch Settings and P/N's

Heat Section Size	Modulating Burner Full Rate - Natural Gas		Setpoint OFF	Label Color	Switch P/N
	Light Off (Cold)	Equilibrium (Hot)			
500	2.6	2.6	1.0	Brown	201160
600	2.8	2.8	1.4	Red	201159
700	2.4	2.4	1.0	Brown	201160
800	2.7	2.7	1.4	Red	201159
1000	2.6	2.6	1.0	Brown	201160
1200	2.8	2.8	1.4	Red	201159
1400	2.4	2.4	1.0	Brown	201160
1600	2.7	2.7	1.4	Red	201159
Heat Section Size	**Gas Non-Modulating Burner Full Rate - Natural Gas**		**Setpoint OFF**	**Label Color**	**Switch P/N**
	Light Off (Cold)	**Equilibrium (Hot)**			
1000	4.2	2.6	2.0	White	234054
1200	4.8	2.9	2.0	White	234054
1400	3.6	2.3	2.0	White	234054
1600	4.8	3.1	2.5	White	222860

FIGURE 22 - Limit Control

Location: A limit control is located in each heat section with the capillary sensor extending across the discharge side of the heat exchanger.

Function: The limit control is a temperature sensitive safety device. If the temperature setting of the limit control is exceeded, the controller will shut down operation of the heat section.

Service: The limit switch will automatically reset when the temperature drops. However, the cause for the limit activating should be found and corrected. If it is determined that a limit control needs replacing, use only a factory-authorized replacement part that is designed for the heat section size.

5.0 Electric Heat Section Maintenance - Models RECB and REDB

WARNING

Turn off the power locking the disconnect switch. Allow the heating elements to cool.

CAUTION: Wearing eye protection is recommended when cleaning the heating elements and cabinet.

Electric Heating Elements and Controls

Location: Refer to **FIGURE 24**, page 34.

Service: Check the heating elements at the beginning of the heating season. The elements are assembled and attached to the electrical panel that is visible on the inner side of the electric heat section. Slide the panel out to access the elements. Carefully clean all dust and dirt from the heating elements using a brush or steel wool. With a vacuum or air hose, clean the inside of the cabinet especially the bottom and sides where dirt and dust will accumulate.

If a replacement is needed, order a complete heat section assembly.

FIGURE 23 - SCR Controller

Location: See the control location illustration in **FIGURE 1**, page 4, and **FIGURE 24** for additional electric heat section control panels. The electric heat section has one or two SCR power controller(s), transformer, relay, digital controller, contactors, fuses, and distribution blocks.

Quantities and types of fuses and contactors depend on the size of unit.

DANGER

High voltages are present on the terminals of the SCR power controller(s).

If replacement parts are required, check with your distributor and use only factory-authorized replacements.

5.0 Electric Heat Section Maintenance - Models RECB and REDB (cont'd)

Electric Heating Elements and Controls (cont'd)

FIGURE 24 - Electric Heat Elements

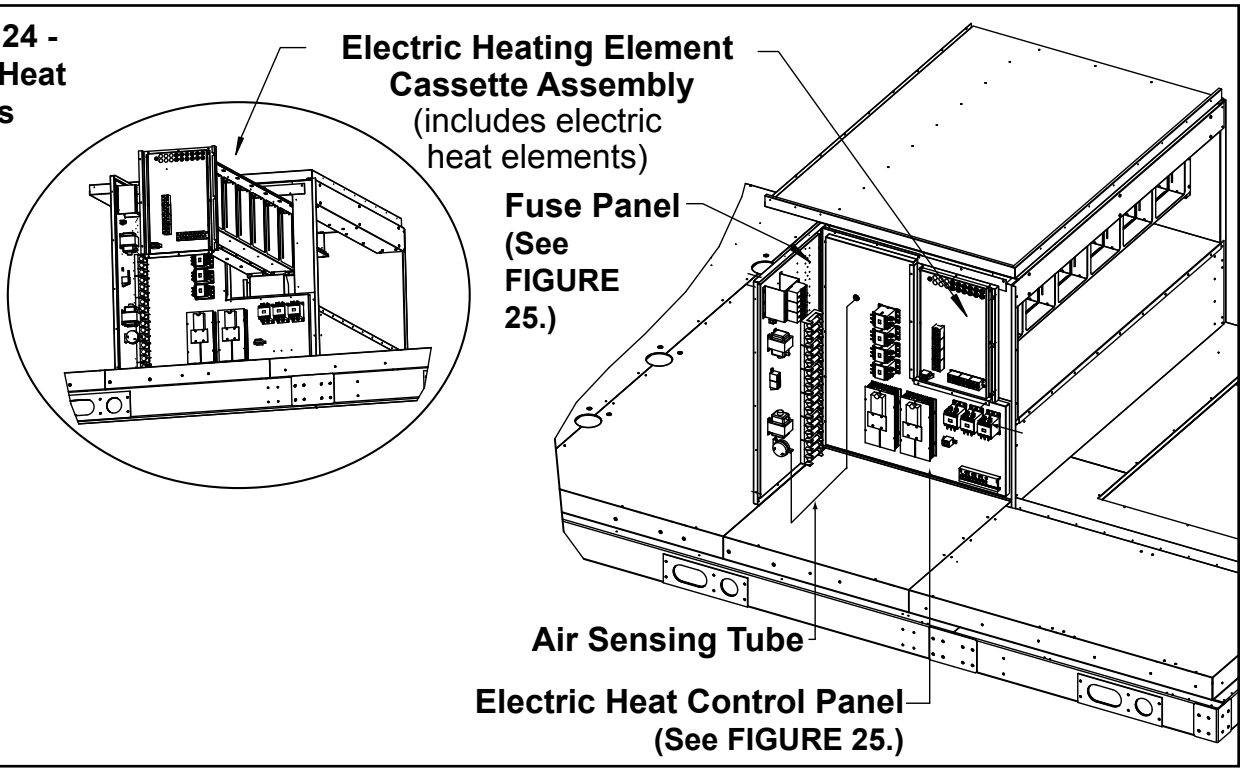
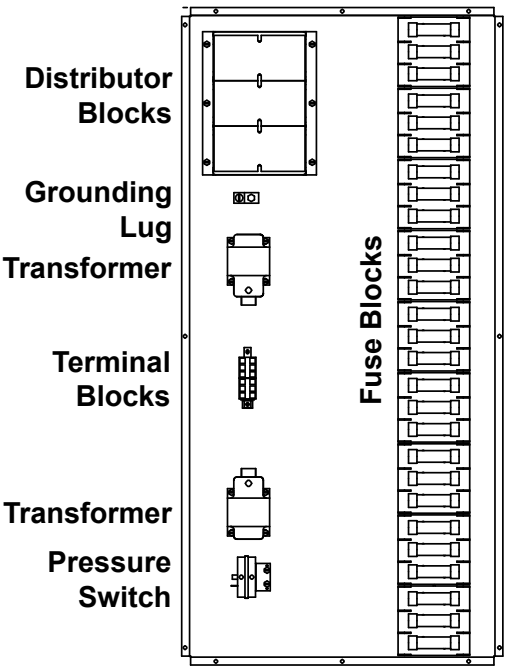
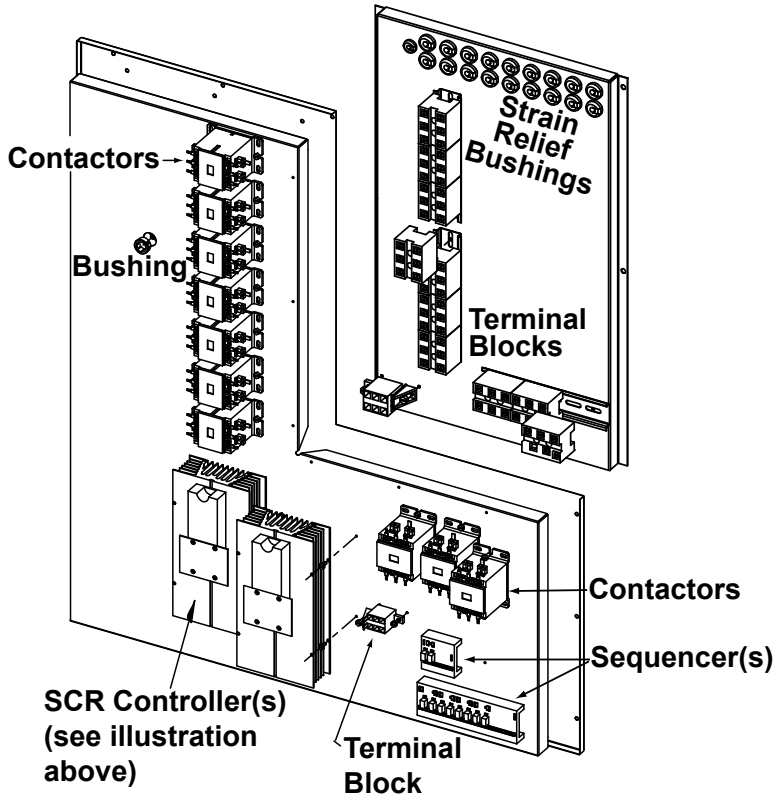


FIGURE 25 - Location of Components on Control Panels in the Electric Heat Section



Typical Fuse Panel (located left in the electric heat section)



6.0 Troubleshooting

6.1 Troubleshooting - RCB, RDB, RDCB, RDDB, RECB, REDB

See Control Instructions for operation/maintenance/ service information on the unit controller.

IMPORTANT: ***Do not release refrigerant to the atmosphere!*** **If required service procedures include the adding or removing of refrigerant, the service technician must comply with all federal, state and local laws. The procedures discussed in this manual should only be performed by a qualified HVAC technician.**

NOTE: Unit is equipped with a phase loss/phase reversal control. If system does not start, check phase of electrical supply.

DANGER:

This unit contains R-410A high pressure refrigerant. Hazards exist that could result in personal injury or death. Installation, maintenance, and service should only be performed by an HVAC technician qualified in R-410A refrigerant and using proper tools and equipment. Due to much higher pressure of R-410A refrigerant, DO NOT USE service equipment or tools designed for R22 refrigerant.

General Refrigeration Circuit - applies to all Models

SYMPTOM	POSSIBLE CAUSE	REMEDY
A. Compressor will not start.	1. Power off, loose electrical connections or fuse open.	1. Check disconnect switch, fuses and wiring. Replace parts or repair as necessary
	2. Compressor contactor not closing.	2. Check voltage to contactor coil, transformer, slave relay, system. Replace parts as necessary.
	3. Internal compressor thermal overload open.	3. If compressor is hot, allow 2 hours to cool. See D. below.
	4. Compressor defective.	4. Check compressor for electrical failure. Compressor may be seized; check refrigerant. If necessary, replace compressor.
	5. High or low pressure switch open or defective.	5. If manual reset (high pressure), reset switch. (Switch opens at 600 psi and will not reset above 400 psi.) If auto reset (low pressure) does not reset and everything else is OK, replace low pressure switch, **P/N 216380**.
B. Compressor starts but cuts out on low pressure (low pressure switch activates at 35 psig.)	1. Low refrigerant charge.	1. Check subcooling; see Paragraph 3.5.
	2. Airflow restricted.	2. Check for dirty evaporator coil, dirty filters, dampers closed, iced evaporator coil, and/or improper belt. Check motor amps. Check duct design.
	3. Restriction in refrigerant line.	3. Check subcooling and superheat (Paragraph 3.5). Check operation of the thermal expansion valve. Check for pressure drop across the filter drier.
	4. Defective low pressure switch.	4. Check switch (opens 35 psi; closes 50 psi). If defective, replace low pressure switch, **P/N 216380**.
C. Compressor starts but cuts out on high pressure switch.	1. Refrigerant overcharge.	1. Check subcooling; see Paragraph 3.5.
	2. Condenser fan motor defective.	2. Check fan motor.
	3. Condenser coil inlet obstructed or dirty.	3. Check coil and inlet clearances and for possible air recirculation.
	4. Air or non-condensables in system.	4. Check high side equalized pressure reading with equivalent outdoor temperature.
	5. Defective high pressure switch.	5. Check switch (opens 600 psi; proof 700 psi; manual reset allowed below 400 psi). If defective, replace high pressure switch, **P/N 216379**.
	6. Restriction in discharge or liquid line.	6. Check subcooling and superheat (Paragraph 3.5). Check operation of thermal expansion valves.
D. Compressor cuts out on thermal overload.	1. Low voltage.	1. Check voltage.
	2. Sustained high discharge pressure.	2. Check running amperage and conditions described in I.
	3. High suction and discharge pressures.	3. Check thermal expansion valve operation, check for air in system.
	4. Defective compressor overload.	4. If compressor is hot, allow compressor to cool for two hours. Recheck for open circuit.
	5. Improper refrigerant charge.	5. Check subcooling (Paragraph 3.5).
	6. Bearings or pistons too tight.	6. Check for low oil level.
	7. Allow time for compressor to cool.	7. Check dome temperature of the compressor.
E. Noisy compressor.	1. Reverse rotation.	1. Check at startup. If the suction pressure rises and discharge pressure drops, shut down the compressor. Switch the 3-phase wiring connections.
	2. Refrigerant overcharge.	2. Check pressures and subcooling (Paragraph 3.5).
	3. Liquid floodback.	3. Check thermal expansion valve setting. Check subcooling for refrigerant overcharge (Paragraph 3.5).
	4. Tubing rattle.	4. Dampen tubing vibration by taping or clamping. Carefully bend tubing away from contact where possible.
	5. Compressor defective.	5. Check internal parts. Replace defective parts or compressor.
F. Noisy unit operation.	1. Blower rotational noise.	1. Check blower, motor and drive for faulty adjustment or noisy bearings, loose parts, and/or blower out of balance.
	2. Air noise.	2. Check ductwork. Air velocity too high.
	3. Chattering contactor.	3. Check for adequate control voltage; check for shorts or breaks; check contact points.
	4. Tubing rattle.	4. Dampen by taping or clamping, carefully bend tubing away from contact when possible.

6.0 Troubleshooting (cont'd)

6.1 Troubleshooting - RCB, RDB, RDCB, RDDB, RECB, REDB (cont'd)

General Refrigeration Circuit - applies to all Models (cont'd)		
SYMPTOM	**POSSIBLE CAUSE**	**REMEDY**
G. High suction pressure	1. Excessive load on evaporator coil.	1. Check superheat (Paragraph 3.5). Check for high entering wet bulb temperature. Check for excessive air.
	2. Compressor is unloaded.	2. Check head pressure. Check thermal expansion valve. If valve is not functioning properly, check pressure drop across filter drier.
	3. Expansion valve bulb not secured to suction line or valve defective.	3. Check the thermal expansion valve; ensure bulb is attached properly and insulated
H. High discharge pressure.	1. Refrigerant overcharge	1. Check subcooling. (Paragraph 3.5) Adjust refrigerant charge.
	2. Thermal expansion valve setting	2. Check superheat and adjust valve as needed.
	2. Air inlet to condenser dirty or obstructed.	3. Check for proper clearances and possible air recirculating.
	4. Condenser fan motor defective.	4. Check condenser fan motor(s).
I. Suction pressure is too low.	1. Refrigerant undercharge.	1. Check subcooling. (Paragraph 3.5) Add refrigerant as needed.
	2. Thermal expansion valve setting	2. Check superheat and adjust valve as needed.
	3. Blower running backward.	3. Interchange any two wires from 3 phase disconnect.
	4. Loose blower, pulley, or belts.	4. Check drive pulley alignment and belt tension.
	5. Dirty filter.	5. Check filter and evaporator coil.
	6. Too little air flow or low entering air temperature.	6. Check airflow and entering air wet bulb conditions.
	7. Restriction in suction or liquid line.	7. Check refrigerant circuit for restriction.
J. Head pressure too low.	1. Insufficient refrigerant charge.	1. Check subcooling (Paragraph 3.5). Check for leak. Repair and add refrigerant.
	2. Defective or improperly adjusted expansion valve.	2. Check superheat (Paragraph 3.5) and adjust thermal expansion valve.
	3. Low suction pressure.	3. See “I. Suction pressure too low” above.
	4. Defective compressor.	4. See "G. High suction pressure” above.
K. Compressor short cycles.	1. Improper refrigerant charge.	1. Check subcooling and superheat. (Paragraph 3.5)
	2. Defective high or low pressure control.	2. Check high or low pressure switch.
	3. Liquid floodback.	3. Possible tight bearings, see above.
	4. Defective expansion valve.	4. Check superheat and thermal expansion valve.
	5. Poor air distribution.	5. Check ductwork for recirculating.
	6. High discharge pressure.	6. See “H. High discharge pressure” above.
	7. Leaking discharge valves in compressor.	7. See “G. High suction pressure” above.
L. Running cycle is too long or unit operates continuously.	1. Refrigeration undercharged.	1. Check subcooling (Paragraph 3.5) and add refrigerant.
	2. Dirty filter or evaporator coil.	2. Check filter, coil, and airflow. Clean and/or replace.
	3. Dirty or clogged condenser coil.	3. Check coil and airflow. Clean.
	4. Air or other non-condensables in system.	4. Check equalized high side pressure with equivalent outdoor temperature.
	5. Defective compressor.	5. See “G. High suction pressure” above.
	6. Restriction in suction and liquid line.	6. Check for restrictions in refrigerant circuit.
	7. Control contacts stuck.	7. Check wiring.
M. Supply air temperature is too high.	1. Refrigerant undercharge or leak in system.	1. Check subcooling (Paragraph 3.5). Check for leak. Repair and add refrigerant.
	2. Evaporator plugged with dirt or ice.	2. Check evaporator, airflow, and filter. Clean.
	3. Improperly adjusted or defective expansion valve.	3. Check superheat (Paragraph 3.5) and adjust thermal expansion valve. Check expansion valve bulb placement and insulation.
	4. Defective compressor.	4. Check compressor for proper operation.
	5. High discharge pressure.	5. See “H. High discharge pressure” above.
	6. Airflow is too high.	6. Check external static pressure.
N. Supply air temperature is too low.	1. Airflow is too low.	1. Check evaporator coil; check filters; check for closed dampers or grills; check drive for loose parts, belts, or misalignment; and check external static pressure.
	2. Return air temperature too low.	2. Check entering air wet bulb conditions.
O. Liquid line is too hot.	1. Refrigerant undercharge.	1. Check subcooling.
	2. High discharge pressure.	2. See H. above.

6.2 Troubleshooting Heat Section

6.2.1 General Troubleshooting - Electric Heat Section, Models RECB and REDB

PROBLEM	PROBABLE CAUSE	REMEDY
Unit does not operate	1. No power to unit	1. Turn on power; check supply fuses or main circuit breaker.
	2. Blown fuses	2. Check and replace if necessary.
	3. Defective or incorrect wiring.	3. Check wiring and connections. Refer to wiring diagram provided with unit.
	4. Defective or burned out control transformer	4. Check secondary voltage with voltmeter. Replace if necessary.
Fan operates but element does not heat	1. Dirty filters	1. Check filters and clean or replace if necessary.
	2. Defective air proving switch	2. Check and replace if necessary.
	3. Blown element fuses	3. Check and replace element fuses if necessary.
Insufficient heat	1. Burned out element	1. Turn off power and check element resistance with ohmmeter. Replace if open.
	2. Blown fuses	2. Check and replace if necessary.
	3. Cycling on limit control	3.
		a) Check air throughput (temperature rise).
		b) Check motor rpm against nameplate rating. Replace motor if speed is too slow.
		c) Defective limit control. Check wiring and connections. Check continuity through control and replace if necessary.
	4. Defective or incorrect wiring.	4. Check wiring and connections. Refer to wiring diagram provided with unit.

6.2.2 General Troubleshooting - Gas Heat Section, Models RDCB and RDDB

PROBLEM	PROBABLE CAUSE	REMEDY
Venter motor will not start	1. No power to unit.	1. Turn on power; check supply fuses or main circuit breaker.
	2. No 24 volt power to ignition system circuit board.	2. Check control transformer output.
	3. Integrated circuit board fuse blown.	3. Correct cause; replace fuse.
	4. No power to venter motor.	4. Tighten connections at circuit board and/or motor terminals.
	5. Integrated circuit board defective.	5. Replace integrated circuit board.
	6. Defective venter motor or capacitor.	6. Replace defective parts. Recommend replacing capacitor when replacing motor. See Paragraph 4.1.3.
Burner will not light	1. Manual valve not open.	1. Open manual valve.
	2. Air in the gas line.	2. Bleed gas line (initial startup only).
	3. Gas pressure too high or too low.	3. See installation manual, Form I-MAPSIII&IV, Paragraph 9.2.2.
	4. No Spark: a) Loose wire connections.	4. a) Be certain all wire connections are solid.
	b) Transformer failure.	b) Be sure 24 volts is available.
	c) Incorrect spark gap.	c) Maintain spark gap at 1/8".
	d) Spark cable shorted to ground.	d) Replace worn or grounded spark cable.
	e) Spark electrode shorted to ground.	e) Replace if ceramic spark electrode is cracked or grounded.
	f) Burner not grounded.	f) Make certain circuit board is grounded to ignitor.
	g) Ignition system circuit board not grounded.	g) Make certain circuit board is grounded to furnace chassis.
	h) Unit not properly grounded.	h) Make certain unit is properly field grounded to earth ground and properly phased (L1 to hot lead L2 to neutral).
	i) Ignition system circuit board fuse blown.	i) Correct cause; replace fuse.
	j) Faulty circuit board.	j) If 24 volt is available to the circuit board and all other causes have been eliminated, replace board.
	5. Lockout device interrupting control circuit by above causes.	5. Reset lockout by interrupting control.
Burner will not light (cont'd)	6. Combustion air proving switch not closing.	6. a) Remove obstructions from vent.
		b) Replace faulty tubing to pressure switch.
	7. Faulty combustion air proving switch.	7. Replace combustion air proving switch.
	8. Valve not operating. a) Defective valve.	8. a) If 24 volt is measured at the valve connections and valve remains closed, replace valve.
	b) Loose wire connections	b) Check and tighten all wiring connections.
	9. Circuit board does not power valves. a) Loose wire connections.	9. a) Check and tighten all wiring connections.
	b) Flame sensor grounded.	b) Be certain flame sensor lead is not grounded or insulation or ceramic is not cracked. Replace as required.
	c) Incorrect gas pressure.	c) See installation manual, Form I-MAPSIII&IV, Paragraph 9.2.2.
	d) Cracked ceramic at sensor.	d) Replace sensor.
Burner cycles on and off	1. Gas pressure too high or too low.	1. See installation manual, Form I-MAPSIII&IV, Paragraph 9.2.2.
	2. Burner not grounded	2. Make certain integrated circuit board is grounded to ignitor.
	3. Circuit board not grounded.	3. Make certain integrated circuit board is grounded to furnace chassis.
	4. Faulty integrated circuit board	4. If 24 volt is available to the circuit board and all other causes have been eliminated, replace board.
	5. Combustion air proving switch not closing.	5.
		a) Make sure unit is properly vented.
		b) Remove obstructions from vent.
		c) Replace faulty tubing to pressure switch.
	6. Faulty combustion air proving switch.	6. Replace combustion air proving switch.
	7. Flame sensor grounded.	7. Be certain flame sensor lead is not grounded or insulation or ceramic is not cracked. Replace as required.
	8. Cracked ceramic at sensor	8. Replace sensor.
	9. Incorrect polarity.	9. Reverse line volt leads to integrated circuit board.
No heat (Heater Operating)	1. Incorrect valve outlet pressure.	1. Check valve outlet pressure. See Installation Form I-MAPSIII, Paragraph 9.2.2.
	2. Cycling on limit control.	2. Check air throughput.
Venter motor will not run	1. Circuit open.	1. Check wiring and connections.
	2. Defective integrated circuit board.	2. Replace board.
	3. Defective motor.	3. Replace motor.
Venter motor cuts out on overload	1. Low or high voltage supply.	1. Correct electric supply.
	2. Defective venter motor or capacitor.	2. Replace defective parts. Recommend replacing capacitor when replacing motor. See Paragraph 4.1.3.

6.2.2.1 Troubleshooting the non-modulating furnace with Modulating Gas Control on Sizes 1000, 1200, 1400, and 1600

Check the Lights on the DSI Integrated Control Module (Ignition System Circuit Board)

The ignition system circuit board monitors the operation of the heater and includes two LED signal lights that indicate normal operation and various abnormal conditions. If the heater fails to operate properly, check this signal to determine the cause and/or to eliminate certain causes. See operating sequence in Paragraph 4.2.2.

Operating and Troubleshooting Indicator Lights on Control Module used on the non-modulating furnace on Sizes 1000, 1200, 1400, and 1600

Control Status - Green LED Codes

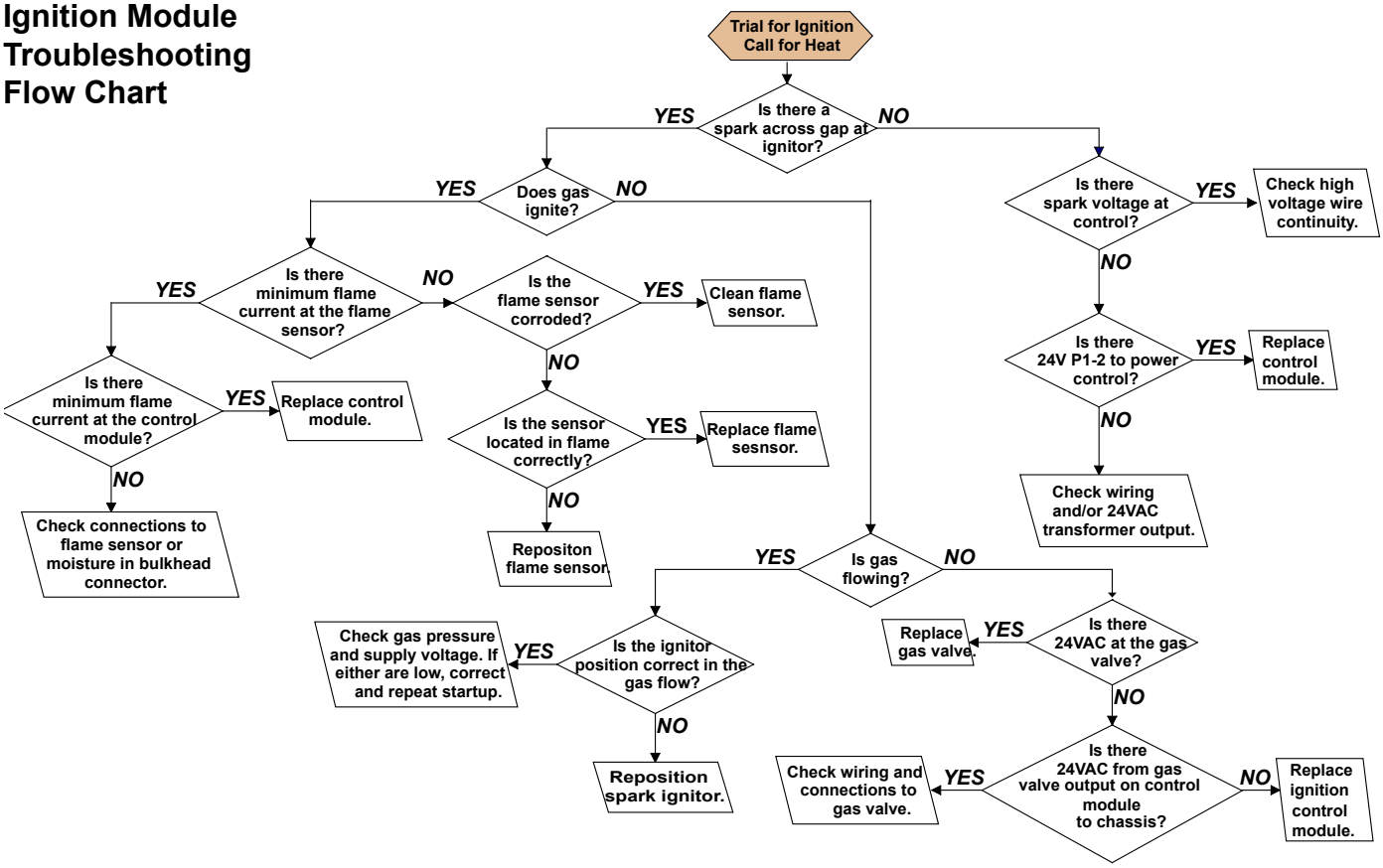
Steady ON ..... Normal Operation, No call for heat
Fast Flash ..... Normal Operation, Call for heat
1 Flash ..... System Lockout, Failed to detect or sustain flame
2 Flashes ..... Pressure Switch Did Not Close within 30 Seconds of Venter Motor
3 Flashes ..... High Limit or Flame Rollout Switch Open
4 Flashes ..... Pressure Switch is Closed Before Venter Motor is Energized
Steady OFF .... Blown fuse, No Power, or Defective Board

Flame Status - Yellow LED Codes

Steady ON ..... Flame is sensed
Slow Flash ..... Weak flame (current below 1.0 microamps ± 50%)
Fast Flash ..... Undesired Flame (valve open and no call for heat)

Do not attempt to repair the DSI integrated control module (circuit board); the only field replaceable component is the fuse. **IMPORTANT:** When using a multimeter to troubleshoot the 24 volt circuit, place the meter's test leads into the 5 or 9 pin connectors located on the ignition control. Do not remove connectors or terminals from the electrical components. Doing so can result in misinterpreted readings due to the ignition control board's fault mode monitoring circuits.

Ignition Module Troubleshooting Flow Chart



6.2.2.2 Troubleshooting the Heat Section Control Module (deep modulation board) used with Modulating Gas Control

The control module **(P/N 257246)** that operates the furnace in a MAPSIII Cabinet D system has a built-in, self-diagnostic capability. The control continuously monitors its own operation and the operation of the system. The LED on the control indicates the current state, warnings, failures, and test modes.

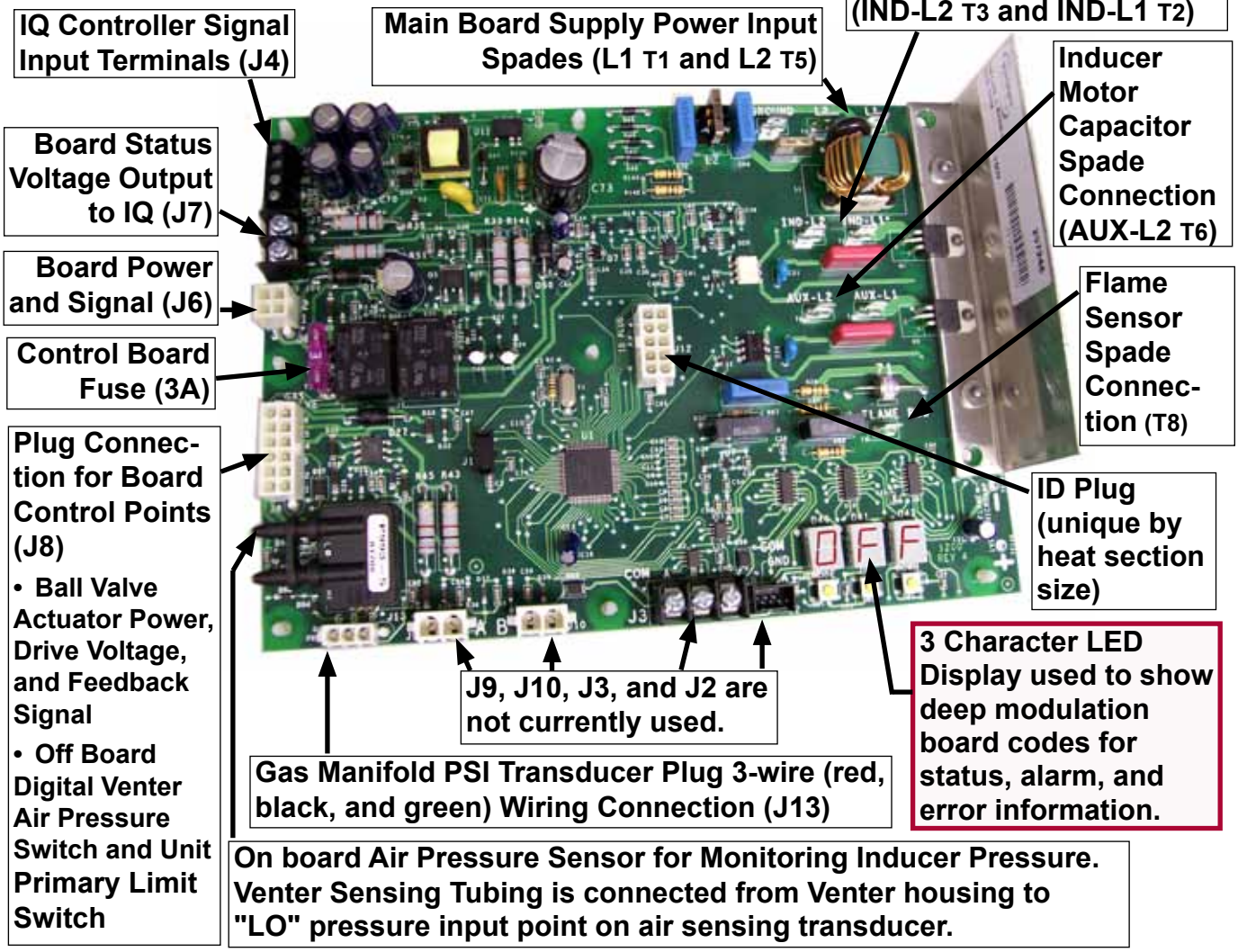
IMPORTANT NOTE: The troubleshooting information applies to the control board that is standard on MAPSIII D Cabinet Models RDCB and RDDB manufactured beginning 8/2011. A Model RDCB or RDDB manufactured prior to 8/2011 may have this board. The ignition board is identified as **"96"** in the Serial No. on the heat section rating plate.

Serial No. Sample: 3 BKH 789 BK 08 N **96** 7D

If the ignition code in the serial number is 96, the following troubleshooting information applies. If the ignition code is 90, 91, 92, or 93, contact your representative or distributor or search RezSpec.com for a previous version of this manual.

Normal Furnace Operation Display		
LED Display	Heat Mode	Description
OFF	OFF Mode (OFF)	System Idle - Control board has power, no faults found, no call for heat.
Pur	PURGE Mode (Pur)	System is purging the heat exchanger – No gas on, no flame, venter motor runs for the specified purge timings. Purge cycles occur immediately before and after each burner operation.
Ign	IGNITION Mode (Ign)	System is initiating burner operation – Ignitor energized, modulating valve moved to ignition setting, gas on. Maintained for the trial-for-ignition period and the five-second flame stabilization period.
HEA	WARM-UP Mode (HEA) - (Board Self Check)	Period between Ignition and Run – System checks completed before modulation control begins.
run	RUN Mode (run)	Normal modulating operation.
rEt	Ignition Retry (rEt)	System has had a failed ignition attempt or has lost flame during burner operation and is beginning another ignition cycle.

Deep Modulation (Option AG70) Ignition Board is in the Heat Section (See FIGURE 12, page 25.)



Gas Heat Section Modulating Control <u>FUNCTIONAL ALERTS</u>				
Code	Alert	Description	Probable Causes	Solutions
A03	Failed ignition attempt (AO1) *Maximum number of allowed retries not met*	The flame could not be established during the trial for ignition period. This alert indicates the maximum number of retries has not been exceeded and furnace operation will continue with another ignition attempt.	See in the LOCKOUT ERRORS section, pages 41-42.	See in the LOCKOUT ERRORS section, pages 41-42.

6.2 Troubleshooting Heat Section (cont'd)

6.2.2.2 Troubleshooting the Modulating Gas Control (cont'd)

Gas Heat Section Modulating Control FUNCTIONAL ALERTS (cont'd)				
A02	Lost Flame (AO2)	The flame sensor signal has been lost after flame is established during a call for heat. This alert is displayed during the RECYCLE period prior to the next ignition attempt.	A. Flame sensor coated	1. Clean flame rod sensor.
			B. Flame sensor improperly mounted or grounded	1. Check flame sensor wiring integrity and ceramic for cracks.
				2. Re-install / replace flame sensor.
			C. Unstable flame pattern	1. Verify that the spacing between the burner body and the burner shield is equal across the entire length of the burner.
				2. Check that the seals between the heat exchanger header and heat exchanger tubes are sound; refer to Paragraph 4.1.1.
				3. Ensure that the heat section door gasket is in place and the doors are properly aligned
			D. Insufficient intermediate gas manifold pressure through main gas safety valve	1. Check for faulty gas valve wiring.
				2. Check 24 VAC to gas valve assembly.
				3. Check inlet pressure to safety gas valve.
				4. Check outlet pressure from the safety gas valve.
				5. Replace safety gas valve if faulty.
			E. Insufficient gas manifold pressure to burner through modulating ball valve assembly	1. Check voltage to gas valve actuator. (2-10 VDC depending on model)
				2. Check alignment and set screw connection between ball valve and actuator. See Paragraph 4.3.
A03	Insufficient Combustion Air (AO3) *Furnace functional*	Furnace cannot achieve desired combustion air flow due to blockage or high altitude operation resulting in a de-rate of the furnace.	A. High altitude operation	1. Normal operation. Furnace automatically de-rates for high altitude conditions.
			B. Partially blocked vent	1 Check air inlet and outlet for blockage.
				2. Check venting configuration for excessive venting length, improper sizing, etc.
			C. Leak in sensing hose	1. Check sensing hose for cracks, crimps, or loose connections.
			D. Low Line Voltage	1. Check the line voltage to the control board. Voltage should be within 10% of nameplate.
			E. Faulty venter assembly	1. Verify that the venter assembly is functioning properly by referring to the sensing pressure chart on page 33.
A04	Limited Low Fire (AO4)	Automatic adaptive program is currently limiting the lower range of modulation at avoid flame loss at minimum fire conditions. The alert is displayed during the run cycle once a flame-out condition has triggered the Limited Low Fire function. This function is reset by cycling power to the board.	A. Low gas line pressure	1. Ensure gas supply is connected to furnace and check for proper line pressure.
			B. Insufficient intermediate gas manifold pressure through gas safety valve	1. Check for faulty gas valve wiring.
				2. Check 24 VAC to gas valve assembly.
				3. Check inlet pressure to safety gas valve.
				4. Check outlet pressure from the safety gas valve – adjust as needed.
				5. Replace safety gas valve if faulty.
			C. Faulty burner operation	1. Check burner orifice for proper size and blockage.
			D. Faulty flame sensor	1. Check flame rod wiring and connections.
				2. Check for proper alignment of flame rod.
				3. Clean flame rod sensor.
			E. Improper alignment of the modulating actuator and the gas ball valve.	1. Check that the alignment of the actuator to the ball valve is correct. The valve must be in the fully open position when the actuator is energized (ACTUATOR DRIVE = 9.6 VDC or greater).
				2. Ensure that the setscrew on the actuator is tightened to the ball valve stem.
			F. Blocked or improper venting	1. Check air inlet and outlet for blockage.
				2. Check venting configuration for excessive venting length, improper sizing, etc.
			G. Improper jumper connection on IQ UI-12 causing AO-4 to show on BacView as alarm and disables heat sequence.	1. Verify that the IQ heating feedback input is set to receive the ignition board voltage output of 0-10VDC from terminals J7 by making sure jumpers are set to receive 0-10VDC signal on UI-12 of the IQ controller.
A05	Weak Flame Signal (AO5)	The flame signal level is less than optimal for this furnace. Maintenance of the flame sensing components is advised.	A. Flame sensor coated	1. Clean flame rod sensor.
			B. Flame sensor improperly mounted or grounded	1. Check flame sensor wiring integrity and ceramic for cracks.
				2. Re-install / replace flame sensor.
			C. Unstable flame pattern	1. Verify that the spacing between the burner body and the burner shield is equal across the entire length of the burner.
				2. Check that the seals between the heat exchanger header and heat exchanger tubes are sound; refer to Paragraph 4.1.1.
				3. Ensure that the heat section door gasket is in place and the door is properly aligned.

Gas Heat Section Modulating Control LOCKOUT ERRORS				
Code	Alert	Description	Probable Causes	Solutions
888	Ignition Board Failure (888)	Ignition board start-up checks have detected an error.	A. Faulty transformer	1. Check 24-volt transformer for correct output.
				2. Check connections and wiring to control board and other components connected to the 24 volt source.
				3. Replace if necessary.
			B. Faulty control board	1. Turn off power to the furnace, wait 30 seconds and turn power back on. Re-try ignition sequence and see if the system responds.
				2. Replace control board if necessary.
E01	Failed Ignition (EO1) *Maximum Retries (3) Exceeded*	The flame could not be established during multiple trial-for-ignition periods (3). The maximum number of retries has been exceeded and the furnace is in a lockout condition. System Shutdown alarm lockout will need to be reset through BacView interface or IQ controller will need to be power cycled.	A. Insufficient gas line pressure	1. Insure gas supply is connected to furnace and check for proper line pressure.
			B Gas valve control turned "OFF"	1. Turn gas valve to the "ON" position
			C. No spark from direct spark ignition	1. Check ignition voltage (115 VAC from board to transformer) and wiring.
				2. Check 24 VAC transformer for DSI board.
			D. Insufficient intermediate gas manifold pressure through gas safety valve	1. Check for faulty gas valve wiring.
				2. Check 24 VAC to gas valve assembly.
				3. Check inlet pressure to safety gas valve.
				4. Check outlet pressure from the safety gas valve – adjust as needed.
				5. Replace safety gas valve if faulty.
			E. Insufficient gas manifold pressure to burner through modulating ball valve assembly	1. Check voltage to gas valve actuator. (7 – 10 VDC depending on model)
				2. Check alignment and setscrew connection between ball valve and actuator (See procedure in Paragraph 4.3.).
			F. Burners do not light	1. Check spark rod assembly for proper location, spark gap, etc.
				2. Verify that the spacing between the burner body and the burner shield is equal across the entire length of the burner.
				3. Check burner orifice for proper size and blockage.
			G. Burners light and remain lit for about 5 seconds	1. Check flame rod wiring and connections.
				2. Check for proper alignment of flame rod.
				3. Clean flame rod sensor.
E02	Primary Limit / Fuse Failure (EO2)	The control board safety fuse has blown or the primary temperature limit has opened indicating safe operating temperatures for this furnace have been exceeded.	A. Improper circulating airflow	1. Check filter / replace if dirty.
				2. Check for improperly sized duct system.
				3. Check for faulty blower motor.
				4. Check for faulty blower motor wiring.
			B. Primary limit switch failure	1. Check for an open primary limit switch at ambient temperature.
			C. Fuse is blown	1. Check and replace fuse on the board.
				2. Make sure fuse socket is tight, crimp fuse terminals if necessary.
			D. Faulty primary limit switch wiring	1. Check primary limit wiring continuity from the switch to the control board.
E03	Modulation Valve Failure (EO3)	The control lost the position feedback from the modulating gas valve actuator.	A. Faulty modulation valve actuator wiring	1. Ensure wiring is connected per unit wiring diagram.
				2. Check for loose pins or bad connections.
				3. Check for frayed wiring or shorts to ground.
			B. Modulation valve actuator failure	1. Ensure actuator has 24 V power.
				2. Ensure actuator is receiving signal from the control board (2-10 VDC).
				3. Check for actuator feedback to the control board (2-10 VDC)
E04	Air Sensor Failure (EO4) *Pressure Sensor Reading Low*	The air sensor reading is too low for operating conditions or the air pressure switch closed when the sensor indicates low flow *The pressure switch MUST be open prior to venter activation.*	A. Faulty wiring or connections	1. Check pressure switch wiring.
				2. Check inducer wiring.
				3. Check for plugged or disconnected vacuum hoses.
			B. Faulty pressure switch	1. Replace pressure switch.
			C. Faulty pressure sensor, located on the board	1. Replace board.
E05	Air Sensor Failure (EO5) *Pressure Sensor Reading High*	The air sensor reading is too high when the venter is off or the air pressure switch open when the sensor indicates high flow. *The pressure switch MUST close to initiate an ignition sequence.*	A. Faulty wiring or hose connections	1. Check pressure switch wiring.
				2. Check venter motor wiring.
				3. Check for broken or disconnected vacuum hoses.
			B. Blocked or improper venting	1. Check air inlet and outlet for blockage.
				2. Check venting configuration for excessive venting length, improper sizing, etc.
			C. Faulty pressure switch	1. Replace pressure switch.

6.2 Troubleshooting Heat Section (cont'd)
6.2.2.2 Troubleshooting the Modulating Gas Control (cont'd)

Gas Heat Section Modulating Control LOCKOUT ERRORS (ccont'd)				
Code	Alert	Description	Probable Causes	Solutions
E06	Gas Sensor Failure (EO6) *Pressure Sensor Reading Low*	The gas transducer reading is too low compared to the expected value for the modulating gas valve actuator position. *When the furnace is operating at 75% or higher -- greater than 8 VDC analog input voltage - the manifold pressure sensor must read 1.4" w.c. or higher*	A. Modulating actuator/ball valve not properly aligned	1 Perform modulating system gas valve alignment procedure; see Paragraph 4.3.
			B. Line pressure too low	1. Ensure line pressure is properly adjusted for the gas and application. Correct as needed.
			C. Intermediate regulated pressure to low	1. Ensure the safety gas valve(s) are properly adjusted to the specified outlet pressure. Adjust per the installation instructions as necessary.
			D. Wrong gas pressure sensor installed.	1. Ensure the proper gas transducer - either natural gas or propane - is installed. Replace as needed.
			E. Gas pressure sensor faulty	1. Ensure gas manifold transducer is installed properly and wired per the unit wiring diagram. Replace as necessary.
E07	Gas Sensor Failure (EO7) *Pressure Sensor Reading High*	The gas transducer reading is too high compared to the expected value for the modulating gas valve actuator position. *When the furnace is operating at 75% or lower - less than 8 VDC analog input voltage -- the manifold pressure sensor must read 2.8" w.c. or lower.*	A. Modulating actuator / ball valve not properly aligned	1. Perform modulating system gas valve alignment procedure; see Paragraph 4.3.
			B. Line pressure too high	1. Ensure the line pressure is properly adjusted for the gas and application. Correct as necessary.
			C. Intermediate regulated pressure too high	1. Ensure the safety gas valve(s) are properly adjusted to the specified outlet pressure. Adjust per the installation instructions as necessary.
			D. Wrong gas pressure sensor installed	1. Ensure gas sensor -- either natural or propane -- is installed. Replace as necessary.
			E. Gas pressure sensor faulty	1. Ensure gas sensor is installed properly and wired per the unit wiring diagram. Replace as necessary.
E08	Improper Flame Signal (EO8)	Control senses flame present when the gas valve is commanded off.	A. Flame remains lit in “Off” cycle	1. Gas valve leaks - check wiring to remove continuous 24V to gas valve.
				2. Gas valve is stuck open – remove, repair, or replace gas valve.
E09	No Firing Rate Input (EO9)	Call for heat is sensed (R & W closed) but firing rate is below defined voltage threshold for furnace operation.	A. Faulty wiring into the “Analog +” and “Analog –“ terminals	1. Ensure wiring is connected per unit wiring diagram.
				2. Check for loose pins or bad connections.
				3. Check for frayed wiring or shorts to ground.
			B. No signal from source.	1. Check firing rate input voltage – must be greater than 1.5 VDC.
				2. Troubleshoot controller providing firing rate input to the deep modulation ignition control board.
EId	Invalid I.D. Plug (Eid)	The installed I.D. plug is not valid for this control board.	A. Incorrect I.D. plug installed	1. Ensure I.D. plug is correct for the furnace – check label.
				2. Ensure I.D. plug is properly inserted into the mating connector on the control board.
				3. With the I.D. plug installed, cycle power to the furnace. The board will display the I.D. plug identity upon power-up.
				4. Install correct I.D. plug as needed.

INDEX

REFERENCES

The Installation Manual, Control Instructions, this Operation/Maintenance Manual, and applicable supplier instructions are shipped with the unit. The literature listed below is currently available or will be soon at www.RezSpec.com or from your Reznor® Representative (1-800-695-1901).

Installation Manual, **Form I-MAPSIII&IV** for Cabinets A, B, C, & D
Control Instructions, **Form CP-MAPS D15/D16/D17/D18**
Replacement Parts, **Form P-MAPSIII&IV**

Record installation information on the back of the installation manual, Form I-MAPSIII&IV, for Cabinets A, B, C, & D.

Keep all booklets for future reference.

www.ReznorHVAC.com
(800) 695-1901